Sources of Economic Growth in Uttar Pradesh

Thesis submitted to Kanpur University, Kanpur

For the Degree of

Doctor of Philosophy in Economics

BY

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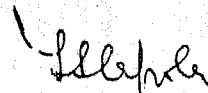# गिरि विकास अध्ययन संस्थान

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CERTIFICAT :

This is to certify that Mrs. Kanchan Singh has worked under my supervision for her thesis entitled "Sources of Economic Growth in Uttar Pradesh" being submitted to the Kanpur University for the award of the Ph.D. degree in Economics.

I further certify that :

(a) the thesis embodies the work of Mrs Kanchan Singh herself;

(b) Mrs. Kanchan Singh has put in over 200 days attendance in the Giri Institute of Development Studies, Lucknow as required by Ordinance 9 of Kanpur University.

T.S. PAPOLA
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CERTIFICATE

This is to certify that the work embodied in this thesis entitled "SOURCES OF ECONOMIC GROWTH IN UTTAR PRADESH" is an original work done by me. I have prosecuted research towards the submission of this work on an ICSSR Doctoral Fellowship for the period of about four and half years at the Giri Institute of Development Studies, Lucknow.

This work, being submitted to the Kanpur University, Kanpur for the consideration of the award of Doctor of Philosophy in Economics has not been submitted whether in whole or in a part thereof elsewhere for the consideration of any degree.

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PREFACE

Economic growth depends on the growth of basic inputs — land, labour, capital and in their combined effeciency or productivity. However, due to constraints on the increase in basic inputs, especially land, it becomes necessary that efforts be made to raise the combined effeciency of basic inputs. Therefore a study on measuring the contributions of various sources of growth and assessing their relative importance in the growth process of the economy assumes vital importance.

On the macro-level, very few studies are available for the country and none so far at the regional level. However, the vastness of the country and widely diverging growth experiences of the regional economies within it require that such studies be carried out at the regional levels. The present study entitled "Sources of Economic Growth in Uttar Pradesh" is an initiative experimental exercise in this direction.

I am grateful to the Indian Council of Social Science Research, New Delhi for giving me the opportunity to work as a full time research Fellow under the salary protection scheme at the Giri Institute of Development Studies, Lucknow.

CONTENTS

Chapter 1

INTRODUCTION

1. Background : A Look Back at Earlier Studies

What sources lead to the growth of output in the long-run? Is the relationship between aggregate output and the sources of its growth essentially a technical one? These are some of the issues that seem to have created enough unrest in the minds of economic theorists since long. In their quest to resolve some of these issues, economists discovered land, labour, capital and also technical change as the proximate sources of growth of real output. However, relative importance which they placed on each of these sources, or group of sources, has varied from time to time.

Early economists believed that growth of real output was primarily a function of growth in quantities of inputs. It does not mean however, that these economists were unfamiliar with the concept of technical change. Adam Smith was quick in noting the importance of this factor.[1] He distinguished both labour saving

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[1] A. Smith, An Inquiry into the Nature and Causes of the Wealth of Nations, E. Cannan (ed.), 1937, Chapter I, pp. 3-12.

and capital saving technological changes. Smith was of
the view that these changes occur through the invention
and application of improved machinery and division of
labour and increase the per capita income by enabling one
man to do the job of many.[2] Technical change was not ignored
by Ricardo. He, however did not believe that these changes
could be powerful enough to prevent the operation of law of
diminishing returns. Instead, he believed that output
growth could proceed only through the growth in capital
accumulation, and as latter was sure to cease due to
the declining tendency in the rate of profit, increase
in real output could not continue indefinitely.[3] Marx

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[2]A. Smith, op. cit, p.7.

[3]D. Ricardo, On the Principles of Political Economy
and Taxation, 3rd edition reprint, E.C.K. Gonner (ed.),
1981, pp.272-284.

For Ricardo's views on economic progress and technolo-
gical change, see :

i) Arnold Heertje, Economics and Technical Change,
Widenfeld and Nicolson, London, 1977, pp.9-19.

ii) H.N. Roy, "Ricardo's Theory of Economic Develop-
ment and Its Relevance to Modern Economic Analysis",
The Indian Economic Journal, Vol.25, No.1, 1977, pp.
227-243.

iii) P.R. Brahmananda, Productivity in the Indian
Economy : Rising Inputs for Falling Outputs, Himalaya
Publishing House, 1982, pp.14-15.

while noting the importance of technological change as
a prime mover in the development of a capitalist eco-
nomy,[4] ended with similar pessimism about the prospects
for future economic growth. Thus, while these econo-
mists took cognisance of technological change as an
important factor in economic growth they failed to
appraise its powerful effect on output growth in the
long-run. This is because they believed that such
changes occur very gradually, causing only a temporary
disturbance in equilibrium.[5]

Neo-classical economists considered technological
change as purely an exogeneous factor. They also under-
emphasised its role because of their pre-occupation
with static equilibrium analysis involving maximisation

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[4](i) Nathan Rosenberg (ed.), The Economics of
Technological Change, Penguine Modern Economic Readings,
1971, p.9.

(ii) Nathan Rosenberg, Inside the Black Box :
Technology and Economics, Cambridge University Press,
1982, Chapter 2, pp.34-54.

(iii) A. Heertje, op. cit., pp.38-61.

[5]A. Heertje, op. cit., pp.35-36.

of output with optimum resource allocation.[6] They failed to realise that "economic growth is, in many important respects, a learning process, a process where by the human factor acquires new skills, aptitudes, capabilities and aspirations. And a pattern of resource use which may maximise output from a given stock of resources may or may not generate the qualitative changes in the human agent which are most conducive to the growth of output in the subsequent time periods".[7]

Since the middle of the twentieth century a major change has occured in economic ideas about the relative importance of increase in factor quantities and technological change in the process of economic growth. Empirical work, mostly for the economy of the United States, has shifted the emphasis from increase in factor quantities as a major source of output growth to technological change. J. Schmookler,[8] F.C. Mills,[9]

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[6]N. Rosenberg,"Neglected Dimensions in Economic Change," in Perspectives on Technology, Cambridge University Press, 1976, pp.93-94.

[7]Ibid.

[8]Jacob Schmookler,"The Changing Efficiency of the American Economy, 1869-1938", Review of Economics and Statistics, Vol.34, No.3, Aug. 1952, pp.214-231.

[9]F.C. Mills, Productivity and Economic Progress, Occasional Paper, No.38, National Bureau of Economic Research (NBER), New York, 1952.

S. Valavanis-vail,[10] J.W. Kendrick,[11] M. Abramovitz,[12]
and S. Fabricant[13] are the protogonists of this view.
Differences among them are no doubt there, but a broad
conclusion emerging from their studies is that during
1869 to about 1955, only a small percentage increase in
per capita real output in the United States could be
explained as due to the increase in traditionally mea-
sured inputs viz. labour, capital and land; the un-
explained residual growth being attributed to the con-
tribution of technological change. Solow[14] using the
explicit assumption of an aggregate production function
wherein technical change was measured as a shift,
succeeded in establishing a theoretical base for mea-
surement of sources of growth. Accordingly he showed

[10]S. Valavanis-vail,"An Econometric Model of Econo-
mic Growth, USA, 1869-1953," The American Economic Review,
Vol.45, No.2, May 1955, pp.208-221.

[11]J.W. Kendrick,"Productivity Trends : Capital and
Labour," Review of Economics and Statistics, Vol.38,
No.3, Aug. 1956, pp.248-257.

[12]M. Abramovitz, "Resource and Output Trends in the
United States, since 1870," The American Economic Review,
Vol.46, No.2, May 1956, pp.5-23.

[13]S. Fabricant, Basic Facts on Productivity Change,
Occasional Paper, 63, NBER, New York, 1956.

[14]R.M. Solow,"Technical Change and the Aggregate
Production Function," Review of Economics and Statistics,
Vol.39, No.3, Aug. 1957, pp.312-320.

that during 1904-1949 about 87½ per cent of the increase
in per capita gross real output could be accounted for
as the contribution of technological change.

After Solow,[15] many attempts have been made to en-
rich this theoretical basis empirically and otherwise.
Attempt has been to shorten the large residual which had
remained unexplained in the earlier studies and inhibited
the understanding of the sources of growth in the eco-
nomy. Solow's[16] own attempt has been important. He
tried to achieve this objective by measuring the part of
productivity growth or technical change embodied in
capital. Denison made a distinct advance in this area
in his 1962 work,[17] further refining and updating it in
his subsequent studies.[18] He shortened the size of the

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[15] R.M. Solow, op. cit., 1957.

[16] R.M. Solow, "Investment and Technical Progress" in
Mathematical Methods in Social Sciences, K. Arrow, S.
Karlin and P. Suppes (eds.), Standford University Press,
1960, pp.89-104.

[17] E.F. Denison, Sources of Economic Growth in the
United States and the Alternatives Before Us, Supplemen-
tary Paper No.13, Committee for Economic Development, New
York, 1962.

[18] (i) E.F. Denison, Why Growth Rates Differ: Post-
War Experience of Nine Western Countries, The Brooking
Institution, Washington, 1967.

residual by ascribing a part of its growth to factor
inputs, especially the labour, by measuring the effect
of quality changes embodied in them. According to him,
education, the main source of increased labour quality,
contributed 23 per cent of the output growth in the
United States during 1929-1957, which was more than
the contribution of physical capital (15 per cent).
The total factor input including quality change is
estimated to have contributed 68 per cent of the growth
of real income. The residual growth of 32 per cent has
been further shortened by identifying and measuring a
number of sources like economies of scale, resource
allocation, shift of labour from agriculture to industry
etc. Denison's final residual which he terms 'advances
in knowledge' contributes only 20 per cent of growth.[19]
In his latter works he has identified and measured many
other sources of growth like irregularities in the
pressure of demand, fluctuations in farm output etc.

(ii) E.F. Denison, Accounting for the United States
Sources of Economic Growth 1929-1969, The Brooking
Institution, Washington, 1974.

(iii) E.F. Denison, Accounting for the Slower Economic
Growth : The United States in the 1970's, The Brooking
Institution, Washington, 1979.

[19] E.F. Denison, op. cit, 1962.

Others, after Denison, continued the analysis of the sources of growth further, by extending the list of previously identified and measured variables. Much of this effort has been on the lines of allocating more and more growth to traditional factors by developing more comprehensive measures for labour and capital input. Gallop and Jorgenson's[20] study uses the concept of a massive real input. Labour input in their study has been adjusted for changes in sex, age, occupation, education and the type of employment while capital input has been adjusted for six asset classes and three legal forms of organisations.[21] Christenson, Cummings and Jorgenson[22] make similar adjustment for measurement of real capital input.

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[20] Frank, M. Gallop and Dale, W. Jorgenson; "U.S. Productivity Growth by Industry, 1947-1973", New Developments in Productivity Measurement and Analysis, J.W. Kendrick and Beatrice N. Vaccara (eds.), Studies in Income and Wealth, Vol.44, NBER, 1980, pp.17-124.

[21] The Six Asset Classes are :

    i. Producers durable equipment,
   ii. Consumers durable equipment,
  iii. Residential structures,
   iv. Non-residential structures,
    v. Inventories, and
   vi. Land.

The legal forms of organisation are (i) Corporate business, (ii) Non-corporate business, and (iii) Household business.

[22] L.R. Christenson, D. Cummings and D.W. Jorgenson, "Economic Growth, 1947-73 : An International Comparison" in Kendrick and Vaccara (eds.), op. cit, pp.595-691.

While these studies seek to narrow the residual by adjusting factor inputs for quality changes, others try to explain its size by making separate estimates of the sources making up the residual.[23]

Though most of the empirical studies on the measurement of the sources of growth have been carried-out for developed economies, some break-through has been made in case of developing economies also. Quite in contrast to the developed economies, all these studies conclude that major source of economic growth is the increase in traditional factor inputs; technological change appears to have made relatively a small contribution.

Bruton[24] dealing with sources of growth in 5 Latin American countries estimated that during 1940-64, technical change contributed 25 per cent of the economic

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[23]Kendrick has estimated the effects of growth in intangible capital stock resulting from investment in health, education and training, research and development etc. in contributing to the growth of the residual. See, J.W. Kendrick, The Formation and Stock of Total Capital, NBER, New York, 1976.

[24]H. Bruton, "Productivity Growth in Latin America," The American Economic Review, Vol.LVIII, No.5, December, 1967, pp.1099-1116.

growth in these countries. Gaathan's[25] study shows
that in Israel during 1950-65, total factor quantity
and total factor productivity, accounted for two-thirds,
and one-third of the economic growth respectively. A
cross-section study by S. Robinson[26] for 39 developing
countries during 1958-66 revealed that 72 per cent of
the measured growth was due to increase in labour and
capital inputs. Of the remaining 28 per cent contri-
buted by technical change, he estimated that 16 per cent
was due to shift of resources from farm to non-farm
activities.

Some other studies which count quality changes as
a part of increase in factor quantity, estimate still
larger contributions of factor quantity and smaller con-
tribution of technological change. Using such an
approach Correa's[27] study for 9 developing countries

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[25] A.L. Gaathan, "Economic Productivity in Israel,
1950-65," Review of Income and Wealth, Vol.16, No.1,
March 1970, pp.1-18.

[26] S. Robinson, "Sources of Growth in Less-developed
Countries : A Cross Section Study," The Quarterly Journal
of Economics, Vol.LXXV, No.3, Aug. 1973, pp.391-408.

[27] Hector Correa, "Sources of Economic Growth in
Latin America," The Southern Economic Journal, Vol.XXXVII,
No.1, July 1970, pp.17-31.

reveals that increase in factor quantity and quality
contributed about 50 to 94 per cent of growth of income
in these countries. Maddison's[28] study relating to 22
developing countries shows that during 1950-65, growth
of capital with an average contribution of 55 per cent
was the most important source of output growth. Adjus-
ting labour input for quality changes due to increase
in levels of health, education and migration of labour
from agriculture to industry, he estimates the contri-
bution of labour input to be 35 per cent. Thus, 90 per
cent of growth in his study turns out to be the contri-
bution of labour and capital; remaining 10 per cent of
being the contribution of technological change. Out of
22 developing countries, Maddison finds that five had
negative residual growth due to decline in resource-
efficiency.

A few studies on the measurement of sources of
growth have been made specifically on India also. Apply-
ing basically the same methodology as used by Denison,

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[28]A.Maddison, Economic Progress and Policy in Deve-
loping Countries, Allen and Unwin, London, 1970.

Dholakia[29] has estimated that during 1948-49 to 1968-69 total factor productivity in India grew at a rate of 0.92 per cent per annum, the technological change contributing 28.70 per cent of the growth of real output during the period. Bramhananda's[30] study shows that during 1950-51 to 1980-81 total factor productivity in India grew at an average compound rate of 1.16 per cent per annum, technological change contributing 32.86 per cent of the output growth.

2. The Present Study

While the macro studies for India mentioned above have their own significance, significantly varied growth experiences of regional economies within the large country, make it interesting to carry out such studies at regional or State levels. Such studies, if available for different states would not only throw greater light on the pattern of growth observed for the national economy, but would also enhance our knowledge about the causes of inter-state growth differentials. Since economic decisions to accelerate the pace of growth

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[29] B.H. Dholakia, Sources of Economic Growth in India, Goods Companion, Baroda, India, 1974.

[30] P.R. Bramhananda, op. cit.

of any State including the decisions to mobilise re-
sources for implementing various programmes (while
guided by the broad objectives set at the national level)
are taken mostly at the State level, it appears necessary
to obtain a greater insight into the pattern of growth
in the State economy and the relative contributions made
by various sources to its past growth. Present study
is a modest attempt in this direction.

The unit selected for the purpose of the study is
Uttar Pradesh. U.P. with a population of 11.09 crores
and an area of 29.4 lakh sq-km. accounts for 16 per
cent of total population and 9 per cent of total area
in the country. The population of the State has been
increasing at an alarming rate. It has jumped from a
rate of 1.8 per cent per annum during 1960-61 to 1970-71
to 2.3 per cent per annum during 1970-71 to 1980-81,
which is higher even the national rate of growth of
population.[31] While important in terms of population
and area, the State is among the most backward in the
country. The State economy which largely stagnated

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[31] Census of India 1981, Series-22, UP, Paper No.1
of 1981.

during the First Three Five Year Plans,[32] started growing
gradually thereafter, and, since the mid-seventies it
seems to have picked up the momentum of growth.[33] Since
1974-75 growth rate has increased in all the three broad
sectors primary, secondary and tertiary compared to the
growth rates experienced during the earlier period since
1960. However, with population increasing at an alarming
rate and very little prospects of increasing land area to
be put into the productive use, reliance is to be placed
on increasing use of capital. However, no significant im-
provement in the economic condition of the masses is likely
to occur in the State unless resources are used more

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[32](i) O.P. Gupta, "Rate of Economic Growth in Uttar
Pradesh and Reasons for Its Retarded Development", in
Economic Backwardness of Uttar Pradesh, paper read at the
Seminar, Nov. 27-28, 1971, pp. 31-37.

(ii) P.K. Bhargava, "The Economic Stagnation of
Uttar Pradesh," in Economic Backwardness of Uttar Pradesh,
op. cit, pp. 23-26.

(iii) T. Prasad, "Rate of Economic Growth in Uttar
Pradesh and Reasons for Its Retarded Development",
Economic Backwardness of Uttar Pradesh, op. cit, pp. 9-15.

(iv) G.S. Kushwaha, "Rate of Economic Growth in
Uttar Pradesh and Reasons for Its Retarded Development",
in Economic Backwardness of Uttar Pradesh, op. cit,
pp. 51-56.

[33]A.K. Singh, "Uttar Pradesh Economy Poised for
Rapid Growth", The Economic Times, Dec, 19, 1986.

productively. A quantitative appraisal of the rela-
tive contributions made by various sources including
total factor productivity or technical change to the
growth rate of output in the past could therefore,
prove useful for this purpose.

3. Objectives and Methodology

Main objective of the present study is to measure
the contributions of traditional factors viz., land,
labour and capital, and also of the technical change
in contributing to the economic growth of the State
and its broad sectors, i.e. primary secondary and ter-
tiary. It also seeks to assess their relative impor-
tance in contributing to the growth of the State economy
and its broad sectors.

Towards the fulfilment of the central objective
as stated above the present study has also to :

i. measure the economic growth in the State
economy during the reference period sele-
cted for the study.

ii. obtain the functional break-up of State
income among the primary factors land,
labour and capital for the reference period.

iii. measure the quantitative and qualitative
growth of labour input in the State
economy for the reference period.

iv. measure the growth of capital and land inputs in
the State for the same period as above.

Quantitative assessment of various sources for
the economic growth of the State would be made follow-
ing total factor productivity method in the neo-
classical frame-work. The methodology assumes that
growth rate of real output in the economy is composed
of growth rate in total factor quantity and growth rate
in total factor productivity.[34] However, the latter
can not be measured as such and is obtained as residual
after subtracting the rate of growth of total factor
quantity from the growth rate of real output. Thus
the crux of the method lies in computing a measure of
total factor quantity and its rate of growth during the
reference period.

The measure of total factor input or total factor
quantity usually includes the traditional factors viz.,

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[34]The two terms 'technical change' and 'total
factor productivity' are in fact not equivalent to
each other. However, in conformity with the usual
practice in empirical economic literature, these
two would be used interchangeably in the study.

land, labour and capital. However, as these factors
are measured in different units and grow at different
rates over time, the measurement of aggregate growth
of factor inputs is done by using index numbers of
these inputs. Series of input indices are combined to
obtain the index of total factor input. Percentage
share of each factor in the net product is used as
weight for aggregating the indices. Use of income
share for this purpose assumes that marginal product
of each factor is equal to its price, so that a one per
cent increase in any input, keeping other inputs cons-
tant, results in increasing the total product by the
percentage amount earned by that factor.

Growth rates of total factor input obtained from
the combined input index when subtracted from the
growth rate of real output would yield the rates of
change of total factor productivity or technical change.
Contributions of different inputs constituting the
index of total factor input would be measured as the
product of the growth rate of the input and its per-
centage share in output during the period. Various
steps in the methodology are listed below :

1.   Estimation of long-term rate of growth of the State economy, on the basis of time series of real income in the state over the reference period, that is twenty years from 1960-61 to 1980-81.

2.   Obtaining functional distribution of State income into, labour, capital and land for the study period.

3.   Construction of time-series of indices of factor inputs viz., labour, capital and land and estimation of average rate of growth of each during the study period.

4.   Derivation of total factor input index as a weighted sum of the three traditional inputs, weights being the percentage shares of these inputs in net domestic product.

5.   Estimation of contributions made by total factor input and its different constituents, and of total factor productivity or the technical change to the growth rate of real output.

Relative importance of total factor productivity in effecting the rate of growth of output would be measured in two ways - (i) treating technical progress

as purely disembodied i.e. without making any adjust-
ment in factor inputs for qualitative changes, and
(ii) treating it as partly embodied; by making adjust-
ment for the quality of labour as effected by increased
education and changing sex-composition among workers.

The present study proposes to undertake the
sources of growth analysis in broad sectors also. Thus
output, input, and total factor input indices would be
prepared for three broad sectors viz., primary, secondary
and tertiary.

4.   Plan of the Study

The Chapter plan of the present study is as
follows :

The present introductory chapter dealing with
background, objectives and method of study is followed
by the exercise in the measurement of economic growth
in Uttar Pradesh (Chapter II). The main aspects of
this exercise include the concept and methodology of
State income estimation, trends in growth rate of real
income during the reference period 1960-61 to 1980-81,

in aggregate and in the broad sectors : primary,
secondary and tertiary.

Chapter III on Factor Incomes by Distributive
Shares seeks to develop a set of weights for combining
indices of factor inputs land, labour and capital. An
exercise to prepare these estimates for major sectors
of the State economy has also been undertaken. Growth
of labour input in Uttar Pradesh is measured in Chapter
IV. It attempts to develop an index of the growth of
working force in U.P. after making adjustments to account
for the definitional changes from Census to Census to
make the data comparable. It also attempts to measure
the qualitative growth in labour input due to increased
education and changing sex-composition of the work force.
Chapter V attempts the measurement of capital and land
input in Uttar Pradesh during 1960-61 to 1980-81. After
reviewing the problems in the measurement of real capital,
an exercise has been made to build the capital input
series for the primary, secondary and tertiary sectors
and for the economy as a whole.

The major objective of the present study of measuring contribution of sources of growth is the subject matter of Chapter VI. The series of labour, capital and land prepared in earlier Chapters have been combined to develop the index of total factor input. Absolute and relative contributions of sources of growth have been measured using average growth rates of factor inputs, total factor input and real output. Similar exercise has been carried out for broad sectors also. The last Chapter (VII) summarises the main findings of the study and concludes by pointing out their implications relating to long term growth process and resource-use-efficiency in the State economy.

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Chapter II

MEASUREMENT OF ECONOMIC GROWTH IN UTTAR
PRADESH

1. Introduction

The measurement of economic growth should ideally
mean an assessment of the long term productive capacity
of the economy and not merely the trends in the current
output. The increase in long term productive capacity
or the productive potential is governed by the number
of factors such as the growth of the working force, im-
provements in its quality, the stock of capital inclu-
ding natural resources available to the economy, accumu-
lated stock of knowledge and aptitude of the society
towards application of this knowledge.[1] A direct mea-
surement of this productive capacity is not possible.
It is, however, possible to measure it at least approxi-
mately,with the help of the actual output data stretching

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[1] E.F. Denison, Sources of Economic Growth in the
United States and the Alternatives Before Us, Supple-
mentary Paper No.13, Committee for Economic Development,
New York, 1962, p.4. Also see Accounting for the
United States Economic Growth, 1929-1969, The Brooking
Institution, Washington, 1974, p.1.

over long periods by isolating the effects of short term
fluctuations. These short term fluctuations and changes
in intensity of resource-use associated with them are
generally caused on account of two factors - (i) ir-
regularities in the pressure of aggregate demand, and
(ii) effect of natural phenomena like draughts, floods
etc.[2] Of the two factors mentioned above, former is more
important for industrially developed economies while
latter plays a crucial role in under-developed agrarian
economies where major part of output is derived from the
agricultural sector.[3]

Real output data conventionally measured in terms
of Real Net National Product or Real Gross National
Product[4] is used as a summary statistic for the purpose

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[2] E.F. Denison, Accounting for the United States
Sources of Economic Growth, op. cit., p.85.

[3] B.H. Dholakia, Sources of Economic Growth in India,
Goods Companion, Baroda (India), 1974, pp.216-217.

[4] Here-after referred as Real NNP and GNP only.

of measuring growth of any nation or region.[5] We have

also adopted this procedure for measuring and analysing

economic growth in the State of Uttar Pradesh, without

going into the wider debate on the suitability and in-

adequacy of NNP or GNP as the true indicator of changes

in the economy. Economic growth in the State has

accordingly been measured with the help of State income

estimates. Thus, before proceeding any further it would

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[5]Some of the important studies to be mentioned in
this connection are :

(i) J. Schmookler, "Changing Efficiency of the
American Economy 1869 to 1938", Review of Economics and
Statistics, Vol.34, No.3, Aug. 1952, pp.214-231.

(ii) M. Abramovitz, "Resource and Output Trends in
the United States since 1870", The American Economic
Review, Vol.46, No.2, May 1956, pp.5-23.

(iii) J.W. Kendrick, Productivity Trends in the
United States, 1948-1969, Princeton University Press,
1961.

(iv) E.F. Denison, Sources of Economic Growth in the
United States and the Alternatives Before Us, op. cit.

(v) E.F. Denison, Why Growth Rates Differ : Post-
War Experience of Nine Western Countries, The Brooking
Institution, Washington, 1967.

(vi) Simon, Kuznets, Modern Economic Growth, Yale
University Press, New Haven, Connecticut, U.S.A., Indian
edition, 1972.

be better to say a few words about the available income statistics in the State, its concept and the methodology of its preparation.

2. State Income Estimates

The earliest attempt to estimate State income in the State was made by S.G. Tiwari.[6] However, Tiwari's main objective was to measure the economic prosperity of the United Provinces (Under British India, Uttar Pradesh was called United Provinces). He estimated income of the United Provinces according to rural and urban sectors for three years namely 1921-22, 1931-32 and 1938-39. Baljit Singh[7] also undertook an exercise to present the economic profile of Uttar Pradesh by making estimates of district incomes for the State. The estimates available from these studies are not usable for the present study as a growth accounting exercise requires series of income estimates for a fairly long period of time. However, Tiwari's study points out to the stagnating nature of the State economy during 1921-22 to 1938-39.

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[6]S.G. Tiwari, Economic Prosperity of the United Provinces, Asia Publishing House, Bombay, 1951.

[7]Baljit Singh, Inter-district Incomes and Economic Profiles of Uttar Pradesh, Lucknow University, Lucknow, 1974, (Mimeo.).

Preparation of State Income estimates at official level and on regular basis is a post-Independence development. It was started in 1948-49 by the Economics and Statistics Division, State Planning Institute, U.P. We have three series of State income estimates prepared by the Directorate of Economics and Statistics, U.P.[*] The first series available covers the period from 1948-49 to 1960-61. The second series called the conventional series extends from 1960-61 to 1972-73. The third series referred as the revised series[8] gives estimates from 1960-61 onwards, latest estimates being available are for 1985-86.

We could not get adequate information regarding coverage, source of data and the method of income estimation for the first series. Hence it has not been used for the purpose of the present study. Between the conventional and the revised series, there are wide variations in the coverage and sources of data. For example,

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[*] Hereafter referred to as DES only.

[8] Work on revised series began in 1967-68 following C.S.O's recommendation to all the States, to follow a uniform pattern of income estimation, so that, the estimates prepared by different States remain comparable to each other. See, Methodology of State Income Estimates of Uttar Pradesh (revised series), State Planning Institute, Economics and Statistics Division, U.P., Lucknow, January 1977, p.2.

classification of industries in the conventional series
lacked the criteria of homogeniety of economic activity
under different sectors, a drawback that has been
removed in the revised series by a redistribution of
economic activity in different sectors. For example,
construction activity which was included under public
administration in the conventional series has been
accorded the status of a separate sector called "cons-
truction" in the revised series. The latter series in-
corporates improvements in the use of reliable and
current data and also in the methods of estimation over
the conventional series. Some of the important improve-
ments are[9] :

1.   Net product from the agricultural sector at cons-
tant 1960-61 prices was estimated in the conventional
series as the product of the gross value of the refe-
rence year at 1960-61 prices and the ratio between net
and gross output as obtained in 1960-61. In the revised
series, it is estimated by working out inputs of that
year at 1960-61 prices and deducting it from the gross
value at 1960-61 prices, during the year.

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[9]Methodology of State Income Estimates (revised
series), op. cit, p.3.

2.   The method of estimation of income from the construction activity has been changed from 'income approach' in the conventional series to 'expenditure approach' in the revised series.

3.   Income generated under the sector 'electricity gas and water supply' which in the conventional series was estimated on the basis of earnings per worker in the construction sector, is estimated in the revised series using the current information available from the annual accounts of State Electricity Board and Local Bodies.

4.   Income from private mechanised transport, which in the absence of any data, was estimated in the conventional series, on the basis of per worker earnings in the private non-mechanised transport sector, is estimated in the revised series with the help of data available from various studies for this purpose, undertaken by DES.

5.   For estimating income from the sector "other services", the conventional series adopted the procedure of projecting all-India average of income per person in the sub-sectors "other commerce and transport" and

"construction". However, in the revised series income from various services is worked out separately on the basis of data available from various rounds of National Sample Survey and latest data available from various departments and institutions.

6. The method of estimating income from the sub-. sector "real estate and ownership of dwellings" has been improved in the revised series by using the information on number of residential houses given in the population Census and information of house rentals available from the Municipal Boards.

It thus appears that, not only the revised series is based on much improved sources of data and better methods of estimation compared to the conventional series, it also provides a longer time span for the purpose of the study. Hence the revised series would be used for the present study.

Having decided to use the revised series for the measurement of economic growth in the State we now proceed to examine the concept and methodology as adopted by DES in its preparation. This has been attempted

in the following section. The next section of this
chapter deals with measurement of the growth of State
income and presents an analysis of its behaviour and
trends. The last section summarises main conclusions
of the analysis and Appendix A given at the end of the
chapter gives details of income estimation under diffe-
rent sectors.

3. Concept and Methodology of State Income

The Economic and Statistics Division, State Plan-
ning Institute, claims to follow broadly the same concept
for State income as recommended by the National Income
Committee and adopted by Central Statistical Organisa-
tion for preparing all-India estimates. The basic con-
cept adopted for the final income estimates is that of
Net State Domestic Product at factor cost (SDP) i.e.,
'Income Originating' or the home produced income. Thus
the State income may be defined as "the volume of goods
and services produced during a given period within the
geographical boundaries of the State in terms of money".[10]

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[10] Methodology of State Income Estimates, op. cit.,
p.1.

No adjustment for inflow and outflow of goods and services across the State boundaries is made for the lack of relevant data.   In this respect "the concept of State income does not strictly correspond to the concept of national income".[11]

Adoption of the income originating concept though facilitates the computation of State income, it has the dis-advantage of making the estimates less reliable by introducing an element of arbitariness in computing income from those activities which extend beyond the boundaries of the State like railway transport, banking and insurance etc. where direct estimation is not undertaken.[12] This is because "the institutional characteristics and nature of these sectors neither coincide nor can be usefully defined in terms of geographical boundaries of the State".[13]

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[11]V.D. Mahajan and D.N. Pitre, "An Operational Plan for the Improvement of State Income Estimates", The Journal of Income and Wealth, Vol.4, No.1, January 1980, p.12.

[12]V.V. Divatia, "On Computation of State Incomes" in Papers on National Income and Allied Topics, Vol.4, No.1, (Eds.) V.K.R.V. Rao, Sen, Divatia and Uma Dutta, Asia Publishing House, Bombay.

[13]V.D. Mahajan and D.N. Pitre, op. cit., p.13.

Further, the concept of State income being based on the 'income originating' approach, is less conducive for measuring the material welfare of the community in terms of increased goods and services which an index of income is usually conceived of as measuring.[14] It thus "serves only as a measure of economic potential of the State".[15]

As at the national level, lack of requisite data prevents the exclusive use of any single method of computation.[16] Hence all the three approaches namely product, income and expenditure have been used. For the activities extending beyond State teritories like railways, State-wide allocation figures provided by C.S.O. are used.

For the purpose of income estimation all economic activities in the State have been grouped under thirteen major heads as given below :

1. Agriculture including animal husbandry

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[14] See (i) S.G. Tiwari, op. cit., pp.37-39, and (ii) V.D. Mahajan and D.N. Pitre, op. cit., p.13.

[15] V.D. Mahajan and D.N. Pitre, op. cit., p.13.

[16] This part relies heavily on the Methodology of State Income (revised series), op. cit., pp.1-49.

2. Forestry and logging

3. Fishing

4. Mining and quarrying

5. Manufacturing (registered and unregistered)

6. Construction

7. Electricity, gas and water supply

8. Transport, storage and communication

9. Trade, hotels and restaurants

10. Banking and insurance

11. Real estate, ownership of dwellings and business services

12. Public administration

13. Other services

For each of the sub-sectors comprising the primary sector i.e. agriculture, forestry, fishery and mining*, production method is used. The method consists in first evaluating gross value of output at the producer's price and then subtracting from it the expenditures on

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* However, for the purpose of this study mining sector has been included in the secondary sector instead of the primary sector.

cost items. Due allowance in made for trade and transport margin. To arrive at the figures of net value added, value of depreciation is also subtracted. Value figures in respect of most of the items in the primary sector are current and reliable. However, the cost figures are generally weak. This is because the primary sector is by and large an unorganised sector. Most of the activities under this sector are concentrated in rural areas. Production is generally carried-on on the household basis with the help of family labour and is not very much greared by profit motive. This combined with illiteracy of the workers, results in the lack of any systematic record of cost incurred in carrying out the production. Hence information on cost items in this sector is rather scanty. Depreciation figures used are also those suggested by C.S.O. However, attempts are being made to obtain regular cost figures in respect of some important crops and other activities in this sector.

Production method is also used in case of registered manufacturing for which current and reliable data both on value and cost items are available on annual basis. However, in the case of unregistered manufacturing no current data exists, since production in this

sector is usually untertaken in the family based
production units. As economic and non-economic acti-
vities in this   sector are greatly interwined an
accurate measurement of the cost incurred in production
becomes difficult. For estimating income in this
sector, information available from various rounds of
National Sample Survey is used.

For estimating net value added from the constru-
ction activity, expenditure approach is used. The method
consist of estimating total expenditure on construction
in the State and then bifurcating it into new construc-
tion and repair and maintenance. For this purpose
total expenditure incurred on pucca construction, kuchha
construction and land development etc. in the public
sector and private sector, is estimated first. Of the
total expenditure on pucca construction, 33.3 per cent
is taken to constitute the gross value of the product
generated under this sector. In case of kuchha cons-
truction and land development, this percentage is taken
as 90. Net State Domestic Product from this industry is
obtained, after making a 2 per cent allowance for depre-
ciation from the gross value of the product.

In all other (remaining) sectors net domestic output is obtained by using the income approach. For organised segment of these sectors especially that relating to public sector like, Electricity Board, State Road Transport Corporation, State Warehousing Corporation and State Trading Corporation etc. income is estimated on the basis of current information on wages and salaries, interest, rents and operating surplus available from their annual accounts. In case of unorganised segment income is generally estimated as the product of the number of workers and per worker earnings obtained from various rounds of National Sample Surveys and studies undertaken by the DES at some points of time. Average per worker earnings for other years are obtained by moving the average value of earning in the survey year, with the help of some indicator (for details see Appendix A).

As mentioned earlier for activities of the supra-regional nature like railways, post and telegraphs, banking and insurance etc. which are not confined to the

boundaries of State only, State-wise allocation figures obtained from C.S.O. are used (for methodological details of sectoral income estimation see Appendix A).

4. Growth of Real Income : Its Behaviour
    and Trends

The object of this section is to measure economic growth in the State during the two decades from 1960-61 to 1980-81 with the help of real output series in the State.

4.1 Problems in Measurement and Choice of Time Period :

Real output, between any two points of time which are fairly apart, varies on account of two factors : (i) ability of the economy to produce goods and services or its productive potential; and (ii) changes in the ratio of actual production to potential production.[17]

Divergence between the rates of these two factors results in short-term fluctuations in actual output

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[17]E. F. Denison, Sources of Economic Growth in the United States, op. cit., pp. 3-4.

series around the potential level,[18] and these short-term fluctuations are likely to overshadow the sustained increase in real output or economic growth[19]— unless the two end years chosen for the comparison of growth have some important basic similarities.

In under-developed agrarian economies, short-term fluctuations are caused by irregular farm output which itself depends on vagaries of monsoon and weather conditions. Measurement of economic growth in them, therefore, requires that the initial and the terminal years should not be much dissimilar in these respects. Our choice of the period 1960-61 to 1980-81 has been guided, firstly by the availability of data, secondly because the two end points do not show any marked dissimilarity in weather conditions; and thirdly because the chosen end points coincide with two Census years namely 1961 and 1981.

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[18]Ibid, p.18.

[19]"By a sustained increase we mean a rise of such magnitude that is not overshadowed by short-term fluctuations ..... If we have evidence of a sizeable movement, relative to the fluctuations over this long period, we can presume that the forces making for economic growth are marked and persistant", Simon Kuznets, Modern Economic Growth, IBH Publishing Company, Oxford, Indian Edition, 1972, pp. 26-27.

4.2 Growth of Aggregate Real Income in U.P. : With our main objective stated and the time period specified we now present the estimates of real state domestic product and the series of index number prepared with the help of these estimates (Table II.1).

Table II.1 : Estimates of Net Real State Domestic Product and Its Indices in Uttar Pradesh at 1970-71 Prices

Years	Real SDP*(in crore Rs.)	Index of Real SDP
1960-61	3209.85	100.00
1961-62	3251.40	101.29
1962-63	3201.62	99.74
1963-64	3116.61	97.10
1964-65	3609.94	112.46
1965-66	3480.40	108.43
1966-67	3118.15	97.14
1967-68	3523.22	109.76
1968-69	3502.05	109.10
1969-70	3860.76	120.28
1970-71	4126.91	128.57
1971-72	3884.99	121.03
1972-73	4120.10	128.36
1973-74	3923.14	122.22
1974-75	4098.96	127.70
1975-76	4471.31	139.30
1976-77	4603.16	143.41
1977-78	5008.97	156.05
1978-79	5188.67	161.65
1979-80	4419.52	137.69
1980-81	5483.13	170.82

Source : State Income Estimates of U.P. Bulletin, Nos. 175 & 199, Economics & Statistics Division, State Planning Institute, U.P., Lucknow.

* For the reasons that would be explained latter the income generated under the sub-sector real estate and ownership of dwellings and business services has been excluded.

According to Table II.1, real output in the State
during the two decades has grown by 70.82 per cent. A
closer examination however reveals that the growth ex-
perience of the two decades differ considerably. As
an instance, real output during the first ten years i.e.
1960-61 to 1970-71 has grown by 28.57 per cent and in
the second decade i.e. 1970-71 to 1980-81 by 32.86 per
cent.

Table II.1 further shows that the real output has
been fluctuating during the entire period, reflecting
the underdeveloped nature of the State economy. But,
the frequency of these fluctuations is considerably re-
duced during the second decade.[20] Decline in the fre-
quency of income fluctuation during the second decade
shows that the period 1970-71 to 1980-81 witnessed a
higher rate of growth and stability as compared to the
earlier period of the study 1960-61 to 1970-71. Diffe-
rences in the growth performance of these two periods

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[20]While during 1960-61 to 1970-71, real income in
the State economy has fallen five times below its pre-
vious level, there are only three such declines during
the latter decade 1970-71 to 1980-81.

are clearly revealed in Table II.2 which presents average compound growth rates of the State economy.

Table II.2 : Growth Rate of Real Output
in the State

Period	Growth rate[21] (in per cent per annum)
1960-61 to 1980-81	2.71
1960-61 to 1970-71	2.54
1970-71 to 1980-81	2.88

Source : Table II.1.

Growth rates given in Table II.2 show, that the real output during the two decades has grown by 2.71 per cent per annum. Growth rate during 1970-71 to 1980-81 happens to be .34 percentage points higher[22] than during 1960-61 to 1970-71.

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[21] Average compound growth rates have been calculated using the formula $P_t = P_o (1 + \frac{r}{100})^t$ where r is the rate of growth, t the value of the time variable and P_o and P_t are the values of real output in the base and the final years respectively.

[22] Differences in rates of growth measured even in tenths of the percentage points are important from the point of view of their end results. For example, if the national product grows at a rate of 4 per cent than at 3 per cent per annum, at the end of the twenty years it would be 21 per cent larger, and the increase in national product would be 44 per cent. See, E.F. Denison, Sources of Economic Growth in the United States, op. cit., pp.5-6.

4.3 Sectoral Growth : To understand the behaviour of
aggregate real output in the economy and the trends
revealed by it, a study of sectoral income growth and
changes in the structure of real income will be useful.
Sectors broadly considered for this purpose are the
primary, secondary and tertiary. Indices of real out-
put in different sectors have been presented in Table
II.3. Table II.4 and II.5 present the implicit growth
rates and percentage distribution of real product by
broad sectors of origin.

A significant growth of real income has occured
in all the sectors (Table II.3). If we rank sectors
according to their income growth, the secondary sector
stands first with a growth of 207.74 per cent during
the two decades under study. Second and third positions
go to the tertiary and primary sectors respectively.

Primary Sector : Over the twenty years reference
period selected for the study, real output in the primary
sector has grown at an average compound rate of 1.77
per cent per annum (Table II.4). Rate of growth during

Table II.3 :   Indices of Real Output in
              Broad Sectors

Years	SECTORS			
	Primary	Secondary	Tertiary	Total
1960-61	100.00	100.00	100.00	100.00
1961-62	98.93	113.17	102.66	101.29
1962-63	94.19	124.53	104.59	99.74
1963-64	88.55	134.29	105.05	97.10
1964-65	106.43	147.44	113.24	112.46
1965-66	96.30	156.59	114.79	108.43
1966-67	84.50	114.71	113.85	97.14
1967-68	102.90	135.88	118.14	109.76
1968-69	100.40	138.78	128.93	109.10
1969-70	113.89	160.04	129.26	120.28
1970-71	117.31	181.43	137.07	128.57
1971-72	106.26	176.95	139.24	121.03
1972-73	113.12	190.29	144.89	128.36
1973-74	104.96	190.49	141.95	122.22
1974-75	112.90	181.87	146.90	127.70
1975-76	123.57	201.15	157.31	139.30
1976-77	124.68	218.18	164.90	143.41
1977-78	135.58	246.06	174.69	156.05
1978-79	136.87	271.03	183.98	161.65
1979-80	102.04	279.99	177.74	137.69
1980-81	142.05	307.74	191.54	170.82

Source :   Bulletin No.175 and 199, Economics & Statistics
           Division, State Planning Institute, Lucknow, UP.

Table II.4 : Growth Rates of Real Output
in Different Sectors

(percent per year)

Period	Primary	Secon-dary	Tertiary	All sectors
1960-61 to 1980-81	1.77	5.76	3.30	2.71
1960-61 to 1970-71	1.61	6.14	3.20	2.54
1970-71 to 1980-81	1.93	5.43	3.40	2.88

Source : Table II.3.

Table II.5 : Percentage Distribution of Real
Output by Sectors of Origin

Period	Primary	Secon-dary	Tertiary	All sectors
1960-61 to 1980-81	60.36	16.27	23.37	100.00
1960-61 to 1970-71	63.25	14.36	22.39	100.00
1970-71 to 1980-81	58.26	17.62	24.12	100.00

Source : Same as Table II.1.

the second decade 1970-71 to 1980-81 is .32 percentage
points higher compared to the growth rate during the
earlier decade 1960-61 to 1970-71.

It is apparent from Table II.3, that real output
in this sector has fluctuated throughout. But, the
frequency of these fluctuations is reduced during the
second decade, for, there are only three years during
this period when output has declined relative to its
previous level whereas during 1960-61 to 1970-71 this
phenomenon extended to six years. This shows that with
the increasing use of high yeilding variety of seeds,
chemical fertilizers, better irrigation facilities and
improved farm practices such as crop-mixing, crop rota-
tion and cropping intensity during the second decade
(1970-71 to 1980-81), real output in agriculture, the
major sub-sector of the primary sector, has counteracted
to quite an extent the adverse effects of natural climatic
conditions like weather and monsoon. Relative stability
obtained during the latter decade may therefore be
viewed as a significant change during thirty years of
planned development.

A marked similarity in the behaviour of output is observed between the primary sector and the economy as a whole (Table II.3, col.1 & 4). Except the year 1961-62, change in total real output in the State economy has closely followed changes in the output of the primary sector. The reason, as Table II.5 shows, the sector contributed the largest share of the total real product — more than 60 per cent over the twenty years period (1960-61 to 1980-81). Due to its largest share, a small change in the output of this sector is likely to produce a greater effect in the total output of the economy in comparison to the other two sectors namely secondary and tertiary whose contributions to the total real product have been relatively small. And, it is for the low growth rates[23] observed in the primary sector during 1960-61 to 1980-81 (1.77 per cent per annum) that the over all growth of the economy remained

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[23]The average growth rate of total real product in the economy may be looked upon as the weighted sum of the sectoral growth rates, weights being the shares of the three sectors in the aggregate real product. See, B.H. Dholakia, Sources of Economic Growth in India, op. cit., p. 21.

as low as 2.71 per cent per annum, though relatively
higher growth rates were observed in the other two
sectors.

Secondary and Tertiary Sectors :   During the
twenty years reference period (1960-61 to 1980-81)
secondary and the tertiary sectors have grown at annual
compound rates of 5.78 and 3.30 per cent respectively.

Analysis of the growth pattern of these two sec-
tors shows that there have been fluctuations in the
output of these two sectors also.   But, the magnitude
and frequency of fluctuations has not been as large as
in the case of the primary sector.   In case of the
secondary sector, output has gone down four times
(twice during each decade), while in case of the ter-
tiary sector it has gone down once in the first decade,
and twice in the second decade.   Thus, growth in these
two sectors has been relatively steady compared to the
growth in the primary sector.   While both sectors have
grown during the reference period, a matter of great
concern is that there has been a decline in the growth
rate of the secondary during the second decade 1970-71

to 1980-81 as compared to 1960-61 to 1970-71 while the tertiary sector has improved its growth rate by .20 percentage points during the same period.

4.4 Structure of Real Income : The structure of real income reveals a decline of 4.99 percentage points in the share of the primary sector during 1970-71 to 1980-81 in comparison to its percentage share during 1960-61 to 1970-71 (Table II.5). Percentage shares of both secondary and tertiary sectors mark an increase 1.26 and 1.73 percentage points during the second decade as compared to their respective shares during the first decade.

A shift in the structure of real income, with a gradual decline in the percentage share of the primary sector and increase in the shares of secondary and tertiary sectors is a common feature of economic development. It is noteworthy however, that the share of the commodity producing sector[24] has declined during the

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[24] Share of the commodity producing sector is obtained by adding the shares of primary and the secondary sector.

latter decade (1960-61 to 1970-71). While this seems to have occured due to the slow-down in the growth rate of the secondary sector during 1970-71 to 1980-81, expansion of the service sector with a decline in the share of the commodity producing sector can not be regarded as conducive to the balanced development and is likely to have flared up the rate of inflation in the economy.

4.5 Further Analysis of Growth of Real Output : The decadal growth performance, however fails to bring out the process of growth of the State economy. It can be seen from Table II.1 that the index of real output reveals a zig-zag movement and registers a dismal growth up to 1966-67. However, it shows a sustained increase since 1974-75 except for a fall during 1979-80 which was a bad agricultural year. As the new agricultural technology or the High Yeild Variety programme was introduced in the State in the mid-sixties, it can be generally presumed that a positive change started

occuring in the economy by 1967-68.[25] Hence a study of the growth performance of the State economy with two break-in points at 1967-68 and 1974-75 seems appropriate. Growth rates calculated for the three sub-periods 1960-61 to 1967-68, 1967-68 to 1974-75 and 1974-75 to 1980-81 for the aggregate and sectoral incomes have been presented in Table II.6.

Table II.6 : Average Growth Rates of
Real Income in U.P.

(in per cent per annum)

Period	All sectors	Primary	Secondary	Tertiary
1960-61 to 1967-68	1.34	.41	4.48	2.41
1967-68 to 1974-75	2.19	1.33	4.25	3.16
1974-75 to 1980-81	4.97	3.90	9.16	4.52

Source : Table II.3.

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[25] While the year 1966-67 marks the end of the pre-HYV period, being a severe drought year in the State, it does not provide a satisfactory basis for computing compound growth rates which are sensitive to the choice of the end-points. Moreover, the new agricultural technology which was introduced in June 1965 is likely to have taken some time to show up some significant results. The choice of 1967-68, as a break-in point seems reasonable in this respect.

As the apriori reasoning suggests, growth rates
during 1967-68 to 1974-75 are .75 percentage points
higher compared to the growth rates during 1960-61
to 1967-68 and growth rates during 1974-75 to 1980-81
are 2.78 per cent higher compared to the rates during
1967-68 to 1974-75. It appears therefore, that the
State economy which experienced a negligible growth up-
to 1966-67 started looking up from 1967-68 onwards.
However, a real stride seems to have come since 1974-
75 which is manifested in the high growth rates during
1974-75 to 1980-81 and also thereafter.[26]

Except the secondary sector where growth rates
during 1967-68 to 1974-75 declined in comparison to the
rate during 1960-61 to 1967-68, other two sectors of
the economy namely primary and the tertiary reveal
considerable improvement in their growth since 1967-68.

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[26] Viewing the performance of the State economy
during the Fifth and Sixth Plan periods, it is now
generally believed that the State economy has picked
up the momentum of growth since 1974-75. See, (i)
A.K. Singh, Uttar Pradesh Economy : Poised for Rapid
Growth, The Economic Times, December 19, 1986, and
(ii) T.S. Papola, and Fahimuddin, "Industrial Spurt in
Uttar Pradesh : Myth or Reality?" The Economic and
Political Weekly, February 16, 1985, pp.269-273.

Growth rates in the primary sector during 1967-68 to
1974-75 are 0.92 percentage points higher compared to
the growth rates during the pre-HYV period i.e.,
1960-61 to 1967-68. With the spread of green revolu-
tion and farmers response to new agricultural
technology, growth rate in this sector showed further
improvement during 1974-75 to 1980-81 being 2.57 per
cent higher than during 1967-68 to 1974-75.

In case of tertiary sector also growth rate during
1967-68 to 1974-75 reveal an improvement of 0.72 per-
centage points over that during 1960-61 to 1967-68.
Growth rate during 1974-75 to 1980-81 is 1.36 per centage
points higher as compared to that during 1967-68 to 1974-75;
improvement during 1974-75 to 1980-81 being 2.57 per
centage points than during 1967-68 to 1974-75.

It is indeed encouraging to find out spurt of growth in the secondary sector during 1974-75 to 1980-81. The sector has improved its growth rate by 4.91 percentage points during 1974-75 to 1980-81, over that experienced during 1967-68 to 1974-75.

4.6 Conclusions

Main conclusions emerging from the above analysis are :

1. During the twenty years period as a whole, real product in the State has grown at an average compound rate of 2.71 per cent per annum.

2. The rate of growth was phenominally slow upto 1967-68. But, from 1967-68 onwards, the graph of growth started rising up, and after 1974-75, it shows an encouraging and steady upward trend.

3. Throughout the two decades 1960-61 to 1980-81, real output in the State has been dominated by the behaviour of output in the primary sector.

4. Decade-wise, 1970-71 to 1980-81 has experienced more growth and stability compared to the decade 1960-61 to 1970-71.

5. Relative stability and speedier growth during the latter decade (1970-71 to 1980-1981) has been due to the growth and stability achieved in the primary sector and improved performance of the secondary and tertiary sectors, particularly during 1974-75 to 1980-81.

6. The State economy has experienced a shift in sectoral output in favour of the tertiary sector during the second decade. To some extent, relative gain of the tertiary sector, has been due to the decline in the growth rate of the secondary sector. This phenomenon, does not indicate a healthy trend for the State economy and calls for strengthening the industrial sector.

7. Despite a gradual decline in the percentage share of the primary sector in total real product during the twenty years under study, more than half of the total output still originates in this sector. Thus, given its structure, not much improvement in the overall growth rates of the economy can be expected, unless the rate of growth of the primary sector improves appreciably.

Appendix A

For the purpose of computation of State income all the economic activities in the State have been classified under 13 major heads as mentioned in the text earlier. The method of income estimation and data base in each of these sectors is given below.

Agriculture (including Animal Husbandry)

Net value of output in this sector is obtained by subtracting from the gross value of output, cost of all the inputs including depreciation incurred in the production. Gross value from this sector is obtained separately for crop production and animal husbandry. However, as agriculture and livestock activities are usually carried out together, the two subsectors are treated as one for the purpose of estimating total cost of input.

Gross output in agriculture is first worked out in physical terms by using area and out-turn figures supplied by the Directorate of Agriculture/Board of Revenue U.P. Gross value is then worked out by

multiplying the gross output figures by the correspon-
ding weighted average prices relating to the post-
harvest peak marketing period. Adjustments are also
made for the rice milling charges and higher and lower
value of procurred food grains.

For most of the crops, area figures are available
but out-turn figures are not. These crops for which
out-turn figures are not available, are evaluated on
the basis of information on average yield of some other
specified crops for which out-turn figures are available.
This of course introduces an element of guess-work in
estimation. However, area and production figures for
major crops being available, gross output estimates
for this sector are fairly reliable.

Gross output from animal husbandry, is estimated
on the basis of quinquennial livestock censuses in
the State. Gross output for different products, is
estimated by multiplying number of animals in each
category, by the average yield per animal provided by
State Directorate of Animal Husbandry/Directorate of
Marketing and Inspection or Central Statistical

Organisation.[1] Gross output is then evaluated using
prices of these products, after making due allowance
for trade and transport margin and rural-urban price
variations. Estimates of number of animals of the
relevant categories for the inter-censal years, are
obtained by interpolating the bench mark estimates,
assuming a constant geometric rate of growth.

To arrive at the net value added from crop produc-
tion and animal husbandry sector, certain deductions
for cost of inputs like seeds, manures, cost of live-
stock feed, insecticide, pesticide, diesel oil, irriga-
tion charges, current repair and maintenance etc. are
made from the gross value of the output (crop produc-
tion and animal husbandry). In the absence of any
record of expenditure on cultivation no firm and current
data on cost items are available at the State level.
Cost estimates provided by C.S.O. are used. However,
attempt is made to use the revised rates to various
items of inputs on the basis of latest available infor-
mation.

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[1]Hereafter referred as C.S.O. only.

Forestry

Production method is used for this sector also.
For official exploitation of major forest products,
out-turn and prices are available from the State Forest
Departments. These prices are duely adjusted for trade
and transport margins before using them for evaluation.
Value of gross output so arrived is inflated by 10 per
cent to account for unauthorised exploitation. As no
out-turn figures in case of minor products (except
bamboo) are available, their value is estimated in
terms of royalty.

In the absence of data on cost of inputs and
depreciation for this sector in the State, a certain
percentage, as suggested by C.S.O. is deducted, to
arrive at the net value added.

Fisheries

Income from this sector is estimated, on the basis
of data supplied by State Fisheries Department. The
department provides data on total production of fish as
well as prices. Weighted average wholesale prices of
different varities of fishes are used.

Since no data on cost of fishing in the State are available deduction rates suggested by C.S.O. are used.

Mining and Quarrying

As mining in the State is mostly in the nature of an organised activity, current and reliable data are available both for prices and output. In case of major minerals, these figures are obtained from the Director of Geology and Mining. For mining in the unorganised sector, information available from reports of National Sample Survey is utilised. To arrive at net value added in this sector, deductions for cost and depreciation are made on the basis of rates suggested by the Indian Bureau of Mines, Nagpur.

Manufacturing

For the purpose of income estimation manufacturing sector has been divided under two subsectors (i) registered manufacturing, and (ii) unregistered manufacturing.

Registered Manufacturing : For estimating output from this sector fairly reliable and current data on output, input, depreciation etc. are available from the Annual

Survey of Industries.[2] Using these data net value
is obtained as total output - (total) input + depre-
ciation). The figure arrived is adjusted for imputed
banking charges provided by the C.S.O.

Unregistered Manufacturing : Due to extreme dearth
of relevant data State level income estimation for
this sector was not undertaken upto 1977-78. Percen-
tage share of this State (10.86) in the unregistered
manufacturing sector for all-India in 1960-61, was
adopted for other year also. However since 1978-79,
estimates are prepared at the State level. For this
purpose all the manufacturing units in this sector
have been grouped under 10 major industry groups.
Estimates of gross value added for the non-household
sector in 1974-75, are obtained directly from the C.S.O.
and are based on the data available from the centrally
sponsored scheme on Survey of Small Scale Industries
(CSSI) and all-India Report on the Census of Small
Scale Industrial Units published by the Development

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[2]The ASI data on complete enumeration basis are
available from 1967 onwards only. Hence for years prior
to 1967 net value added were obtained by adding estima-
tes of Census sector and sample sector for this State
from NSS reports". See, Methodology of State Income
Estimates of Uttar Pradesh (revised series), State Plan-
ning Institute, Economic & Statistics Division, Lucknow
(January 1977), p.25.

Commissioner Small Scale Industrial Units. Estimates

of gross value added for the household sector are

based on the NSS-29th Round.[3] Estimates for household

and non-household sector for 1974-75 are added. These

are adjusted for the consumption of fixed capital at

the rates suggested by C.S.O. and are moved to other

years with the help of physical indicators of output/

input. Constant price estimates so derived are conver-

ted at current prices with the help of price indices

of relevant commodity groups and are corrected with the

help of an adjustment factor.[4]

Construction

This sector includes all the construction, repair

and maintenance and demolition work in the State carried

out by Government (Central and State), departmental and

non-departmental commercial undertakings and the private

sector.

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[3]Report No.280/3, Tables with Notes on Survey of
Self-employed Households in Non-agricultural Enterprises:
Detailed Results, 29th Round (July 1974-June 1975),
National Sample Survey Organisation, Ministry of Planning,
Govt. of India, 1978.

[4]The adjustment factor has been prepared with the
help of State estimated figure and CSO estimated figure
for this sector in U.P. in the year 1977-78. See, State
Income Estimates, Bulletin No.199, Economic & Statistics
Division, State Planning Institute, U.P., p.34.

For evaluation of value added by the construction activity expenditure approach is used. The method consists in estimating the total expenditure on construction and on (ii) expenditure on repairs and maintenance. A certain proportion of total expenditure is taken as value added by the construction activity. This proportion is different for kuchha and pucca construction as well as for new construction and repair and maintenance. To arrive at net value added deduction is made for depreciation.

Data base for estimating value added from this sector is not very firm. Although figures of expenditure on construction undertaken by Central Govt., State Govt. and local bodies are available, there are problems in estimating expenditure on construction by some departmental and non-departmental undertakings whose activities extend to many States such as Post and Telegraph, Railways, Life Insurance Corporation etc. Expenditure incurred by these establishments is either obtained from C.S.O. or is culled from their annual accounts.

No current data on household expenditure on construction either in the rural or in the urban sector are available.

For rural household sector bench mark estimates
of expenditure per person on pucca and kuchha constru-
ction obtained from the studies[5] carried out by State
Statistical Bureau[6] at different points of time. These
are interpolated and extrapolated to obtain estimates
for other years and are multiplied by mid year annual
population. The figures obtained are deflated by the
index of wages, of rural unskilled labour to arrive at
figures of total expenditure on construction by the
rural household sector.

For urban household construction also, current
data do not exist. Same method of moving forward and
backward estimates of per household expenditure on
pucca and kuchha construction available from NSS Reports[7]
and studies undertaken by SSB is adopted. The figures
are multiplied by number of urban households and deflated

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[5](i) Capital Formation by Households in Rural Areas
of Uttar Pradesh (1959-60); and

   (ii) Capital Formation in Rural Areas of Uttar
Pradesh, (1969-70), State Statistical Bureau, U.P.

[6]Hereafter referred as SSB only.

[7]Capital Formation in Urban Areas of Uttar Pradesh,
Report No.136, National Sample Survey Organisation,
Cabinet Secretariate, Govt. of India, New Delhi.

with the wage indices of rural skilled labour to arrive
at total expenditure on construction in different years.

Electricity, Gas and Water Supply

Value added in this sector is obtained by using
income approach. In case of electricity estimates of
factor incomes are obtained from the annual accounts of
UPSEB.[8] For private companies and municipal corporations
in this sector, state level data is not available. Value
added for them, is therefore obtained on the basis of
sale of energy by these units, in the State.

Income from water supply, is obtained on the basis
of wage and employment data, available from the munici-
palities. Compansation to employees is estimated on
the basis of this data. For other factor incomes, figures
are culled from annual survey of industries.

In case of gas, value added in this State is taken
as negligible.

Transport, Storage and Communication

From the point of view of income estimation, econo-
mic activities in this sector have been classified under

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[8] Uttar Pradesh State Electricity Board.

three heads viz. (i) Transport, (ii) Storage, and (iii) Communication. Separate estimation for each activity is undertaken by using income method.

Transport includes railway transport, road transport (mechanised and non-mechanised), air and water transport and services incidental to transport like *packing, crating, travel agency services etc.

For railway transport no estimation is undertaken at the State level. State-wise allocation[9] figures supplied by C.S.O. are used.

SDP from mechanised and non-mechanised road transport is estimated separately. In case of public sector current data are obtained from State Road Transport Corporation, U.P. No current data on mechanised road transport in the private sector are available. Income is estimated by using the information available from NSS report.[10] Value added per worker for rural and urban

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[9]For method of allocation of SDP from rail transport to different States kindly refer National Account Statistics : Sources and Methods, C.S.O.,Ministry of Planning, Govt. of India, 1980.

[10] NSSO-29th Round, op. cit.

sectors obtained from the report for 1974-75 are moved to other years with the help of the index of wages of rural skilled labour and consumer price index of urban skilled labour. These figures are multiplied by the working force engaged in mechanised road transport (bench mark estimates are moved to other years with the help of number of vehicles on road).

In case of non-mechanised road transport studies under-taken by Economic and Statistics Division, SPI are relied upon.

For water transport and services incidental to transport, the only information available is the number of workers. Average earnings per worker in this sector are taken to be the same as in the non-mechanised road transport.

In case of air transport also data coverage is incomplete. Information provided by Hind Flying Club and Indian Air Lines is used.

Communication

In case of communication also no estimation at State level is undertaken. Value added figures as supplied by C.S.O. are adopted.

sectors obtained from the report for 1974-75 are moved to other years with the help of the index of wages of rural skilled labour and consumer price index of urban skilled labour. These figures are multiplied by the working force engaged in mechanised road transport (bench mark estimates are moved to other years with the help of number of vehicles on road).

In case of non-mechanised road transport studies under-taken by Economic and Statistics Division, SPI are relied upon.

For water transport and services incidental to transport, the only information available is the number of workers. Average earnings per worker in this sector are taken to be the same as in the non-mechanised road transport.

In case of air transport also data coverage is incomplete. Information provided by Hind Flying Club and Indian Air Lines is used.

Communication

In case of communication also no estimation at State level is undertaken. Value added figures as supplied by C.S.O. are adopted.

Storage

For warehousing and cold storage net-domestic product is obtained using current data on factor incomes available from State warehousing corporation U.P. and Annual Survey of Industries.

Trade, Hotels and Restaurants

All the wholesale and retail trading activities including export, import and auctioneering come within the purview of this sector.

Income method has been used for those wholesale and retail traders who are assessed for the purpose of income tax. Data on number of trading units and their incomes are obtained from the income tax department.

For all the trading units not registered for the purpose of income tax gross income per worker is obtained on the basis of NSS report. Per worker values are multiplied by number of workers engaged in these trading activities. Depreciation at the national level is deducted to arrive at the net value added.

Banking and Insurance

For most of the banking and insurance services
State-wise allocation figures supplied by CSO are used.
For the financial institutions whose activities are of
localised nature factor incomes are estimated by the
analysis of their annual accounts.

Real Estate and Ownership of Dwellings

This sector includes activities of real estate
dealers and the income originating from the ownership
of residential dwellings.

In case of ownership of dwellings per person rental
in the urban sector for 1967-68 given in SSB report[11]
is moved to other years with the help of year-wise
rental value per residential house for the municipal
houses. There being no reliable data for the rural
sector, rental per person in rural area is taken as 1/3
of the urban areas. The estimates are multiplied by
the number of Census houses in urban and rural sectors
separately and added to get the gross rental from owner-
ship of dwellings. Number of houses during inter-censal

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[11]Uttar Pradesh Me Awason Ki Dasha 1967-68, Bulletin
No.138, SSB.

years are obtained by interpolation and extrapolation assuming geometric rate of growth. Current and reliable data on cost of maintenance and repair is also not available. Hence, percentages as at the national level are used.

For real estate SDP in 1960-61 for this sector was obtained from CSO. This allocation to the State was based on the basis of working force. For other years net product per worker in real estate is moved forward with the help of index of annual average earnings of factory worker. These figures were multiplied by the projected number of persons in real estate. The product gave estimates of SDP for real estate at current prices.

Estimates of ownership of dwellings and of real estate, are added together to give the SDP from this sector.

Public Administration

SDP from this sector is the total of wage and salaries, honoraria (excluding travelling allowance) pension, employers contribution to provident fund and all wage supplements in cash or kind.

For the administrative services of the Central Government data is obtained from CSO. For State Government, estimates of expenditure on wages and salaries is obtained from their budget accounts. As expenditure on administrative staff alone is required, expenditure on wages and salaries of the government staff engaged in other commercial undertakings such as railway, education and health etc. is subtracted from it.

Estimation of SDP for Local Bodies is based on the analysis of their annual accounts.

Other Services

This sector includes education, research, medicine, sanitary, religious and community services, legal services, recreation and entertainment services, personal service and services not specified elsewhere.

To facilitate income estimation all the activities in this sector have been regrouped under four groups viz. (i) education and research, (ii) medical and health, (iii) sanitary services, and (iv) all other services. The method has been to estimate SDP for each group, as a product of per head earning in the group and the working force. SDP for each group is added to get the final estimate of SDP from this sector.

Chapter III

FACTOR INCOMES BY DISTRIBUTIVE SHARES IN U.P.

Our aim in this chapter is to develop a set of weights for combining the indices of the three factor inputs land, labour and capital growing probably at different rates over the period of study. Two approaches are generally adopted for developing such weights. One is to use relative factor price ratios of the three factors in the base year[1] and develop relative weights on the basis of relative price ratios. Another variant is to derive the set of weights on the basis of relative income shares of the three factors in the value added.[2] It is the latter approach that would be used for the purpose of this study.

Data for preparation of factor shares are not readily available in the State. Lack of the requisite data and absence of sustained efforts to obtain the functional break down of State income have resulted in a complete

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[1] J.W. Kendrick, _Productivity Trends in the United States_, Princeton University Press for NBER, 1961.

[2] E.F. Denison, _Sources of Economic Growth in the United States and the Alternatives Before Us_, Supplement Paper No. 13, Committee for Economic Development, New York, January 1962.

dearth of factor income estimates for the State. Though
data are not easy to get for the national economy as well,
yet many attempts have been made to provide factor income
estimates at the level of the country as a whole.[3] The
Central Statistical Organisation (C.S.O.) has also star-
ted providing functional break-down of National income
since 1960-61.[4] Yet, to our knowledge, no attempt, either
officially or unofficially, has so far been made to provide
corresponding estimates at the State level. Hence a

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[3](i) S.J. Patel, "Distribution of National Income
of India 1950-51", Indian Economic Review, Vol.III, No.1,
February 1956, pp.1-12.

(ii) N.S.R. Shastry, "The Distribution of National
Product in India", a mimeographed paper, prepared in con-
nection with the International Conference for Research
in Income and Wealth, de Pietersberg, 1957.

(iii) A. Chatterjee, "Factor Shares in National Income
in India, 1956-57", mimeographed No.171, Indian Statistical
Institute Calcutta, 1959.

(iv) M. Mukherjee, "On the Available Estimates of
the Break-down of National Income by Distributive Shares
of India", Papers on National Income and Allied Topics,
Vol.II, 1962, pp.25-36.

(v) R. Narayanan and B. Roy, "Movement of Distribu-
tive Shares in India, 1948-49 to 1957-58", Papers on
National Income and Allied Topics, Vol.III, 1965, pp.75-
114.

(vi) D.P. Bhatia, Inter-Class Distribution and Growth
of Net National Product in a Developing Economy, Concept,
New Delhi, 1986.

[4]See, National Account Statistics, (C.S.O.), Depart-
ment of Statistics, Ministry of Planning, Govt. of India,
New Delhi, different issues. Hereafter referred as NSS
only.

modest attempt has been made here to obtain the functional
distribution of State income in U.P. during 1960-61 to
1980-81. The chapter has been presented into two parts :
Section I is devoted to the preparation of factor shares
in different sectors and Section II analyses the trends
in the relative movement of factor shares over-time.

Section 1 : Estimation of Factor Incomes

1.1 Preliminary

Theoretically, factor income estimates refer to four
types of income flows relating to four traditionally
accepted factors of production:labour, land, capital and
enterprise. The corresponding income flows are termed
as wages and salaries or compensation to employees, rent,
interest and profit. It is not, however, always possible
to identify and measure all the four income flows separa-
tely. Difficulties arise due to the presence of large
unorganised sector where major portion of value added is
the combined share of all the factors of production
called "mixed income of the self-employed". A functional
break-up of net value added is not therefore possible
without resorting to a set of assumptions. As a conse-
quence, estimates developed here remain tentative only.

Neverthless they reveal the broad trends in the movement of factor shares over-time and yield a set of weights that serves our purpose.

Since our study deals with three broad sectors of the economy viz. primary, secondary and tertiary, factor shares have been prepared on the sectoral basis. Except in the case of primary sector where estimates of all the four factors have been derived, in the remaining two sectors shares in respect of only labour and capital (including land) have been prepared. In some cases, where State level data for preparation of factor shares could not be available, All-India ratios as given in NAS have been used.

1.2 Factor Shares in the Primary Sector

The primary sector comprises of agriculture (including animal husbandry), forestry and fisheries. Shares for all the sub-sectors have been derived separately and added together to obtain the estimates of factor shares in this sector. Procedure of estimation of factor shares in the agricultural sector is given below.

1.2.1 <u>Factor Shares in Agriculture</u> : While there has
been some general awareness among economists about the
growing inequalities in agricultural income, especially
after the introduction of HYV programme, no comprehensive
attempt to provide the estimates of factor incomes and
changes in these shares over-time has been made so far
at least for the State. Recently however, a few studies
have been undertaken at the regional and lower levels of
disaggregation. Studies by Haque and others,[5] J.P. Singh,[6]
M.V. George and others[7] are aimed at highlighting the
differences in the trends in factor income shares among
regions of the country. These authors no doubt, provide
percentage share of factors in agricultural income during
mid and late seventies but they are based on the analysis
of only one or two crops. Then, there have been some

[5]T. Haque, V.K. Sharma and M.S. Bhatia, "Temporal
and Spatial Variations in Factor Shares in Indian Agricul-
ture", <u>Indian Journal of Agricultural Economics</u>, Vol.
XXXVIII, No.3, July-Sept. 1983, pp.391-399.

[6]J.P. Singh, "Factor Shares in Indian Agriculture",
<u>Indian Journal of Agricultural Economics</u>, Vol.XXXVIII,
No.3, July-Sept. 1983, pp.429-434.

[7]M.V. George, N.J. Kurian and C. Chandra Mohan,
"Factor Shares in Indian Agriculture, Temporal and
Spatial Variations and Their Implications", <u>Indian
Journal of Agricultural Economics</u>, Vol.XXXVIII, No.3,
July-Sept. 1983, pp.399-406.

studies confined to a village or a block.[8]

In view of a large number of crops grown each year and wide variations in the agro-climatic conditions among regions in the State, the results of these studies are rather inadequate for our purpose. Hence, an independent exercise has been undertaken to prepare shares for crop production and animal husbandry on the basis of available data. Shares of the primary factors, labour, capital and land corresponding to the income flows viz., wages and salaries, interest, and rents have been estimated independently for crop production and animal husbandry. Deducting the sum total of the estimated shares of land, labour and capital, from the estimates of net value added in the agriculture sector, as made by Economic and Statistics Division, State Planning Institute, profit, the share of the fourth factor 'entreprise' has been obtained. A brief account of the data base, concept used, and the method of preparing these estimates is given below.

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[8]Ram Iqbal, V. Prasad and S.M. Dingar, "Changes in Relative Factor Shares in Agricultural Production (A Case Study)", _Indian Journal of Agricultural Economics_, Vol.XXXVIII, No.3, July-Sept. 1983, pp.445-446.

1.2.1(a) <u>Factor Shares in Crop Production</u>* : For the purpose of preparing factor incomes the whole period of twenty years has been broken into two sub-periods, 1960-61 to 1969-70 and 1970-71 to 1980-81.

No systematic data on cost of cultivation required for preparing factor income estimates are available for either of the two periods, except from the farm management surveys carried out in the State at different points of time. It is only recently that Directorate of Agricultural Research Statistics has started collecting data on various aspects of cost of cultivation under the scheme entitled "comprehensive scheme for studying cost of cultivation/production of principal crops".(here-after referred as the comprehensive scheme). While for the period 1970-71 to 1980-81 data collected under the above mentioned scheme have been utilized, for period 1960-61 to 1969-70 we have relied on data available from "Studies in the Economics of Farm Management in U.P." in Deoria and Muzaffarnagar districts of Uttar

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* A brief account of the data base for preparing factor income estimates in the animal husbandry sub-sector would be given when we come to the preparation of factor shares in that sub-sector.

Pradesh.[9] These two studies[10] provide data on various aspects of cost of cultivation for three consecutive years from 1966-67 to 1968-69. Also, Deoria and Muzaffarnagar districts are considered to be adequately representative of eastern and western regions of the State, and therefore estimates relating to them provide a good basis for generalisation of results for the State of Uttar Pradesh (for details see Appendix B).

It may also be mentioned that concepts, definitions and the basis of evaluation of various farm inputs used in the farm management studies and "Comprehensive Scheme for Studying Cost of Production and Out-turn of Principal Crops" are similar, so that, the results drawn from the two sources are quite comparable.

The main assumption underlying the preparation of factor income estimates is that the share of factor in

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[9] (i) <u>Studies in the Economics of Farm Management in Deoria, Uttar Pradesh</u>, Combined Report 1966-69, Directorate of Economics & Statistics, Ministry of Agriculture, Govt. of India, Undated.

(ii) <u>Studies in the Economics of Farm Management in Muzaffarnagar District, Uttar Pradesh</u>, Combined Report 1966-69, Directorate of Economics & Statistics, Govt. of India, 1975.

[10] Hereafter referred as FMS only.

the value added are equal to the share of factors in the total cost. Total cost of cultivation (per hectare) as given in FMS and the comprehensive scheme has therefore been regrouped under the following heads.

1. Wages : Wages or labour costs represent the payment made by the farmer to the labour engaged in various farm activities such as sowing, tilling, harvesting etc. As bulk of the labour engaged in farms comes from the farm families themselves, it has also been evaluated[11] at the rate paid to the permanent labour. Total wages worked out thus represent the share of labour in value added.

2. Interest : Interest paid in cash or kind for the capital goods including an imputed value for those items of capital which are supplied by the farmer himself, measure the share of capital. Interest charges to different crops have been allocated in proportion to area under the crop to gross area sown.

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[11] The basis of evaluation of family labour hired labour and all other factor inputs like rent and rental value of owned land etc. and also the method of allocation of total cost to different crops mentioned here are those used by FMS and the comprehensive scheme. Both the sources however use same basis for evaluation of inputs and allocation of cost.

3. <u>Rent</u> : Payments made in cash or kind in the form
of land revenue, taxes, lease rents, etc. are included
under this head. Since most of the land under self-
cultivation is acquired by farmers by way of inheritance,
an imputed value at 5 per cent of the value of land at
village price has been assigned for the owned land.
This value has been allocated to different crops in pro-
portion to the area under the crop to gross area sown on
owned land.

It may also be noted here that the two farm manage-
ment studies (Muzaffarnagar and Deoria) and the compre-
hensive scheme provide information about crops covering
more than 60 per cent of the total sown area in the State
during the reference period 1960-61 to 1980-81.[12] For
no better alternative, factor shares for remaining 40
per cent of the area have been assumed to be the same
as for the crops covered under FMS in case of Period I
and under the comprehensive scheme in case of Period II.

In preparing factor shares for crop production,
the practice has been to multiply per hectare estimates

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[12]Calculated on the basis of information about area
under different crops and total area sown in the State,
published in various issues of <u>Agricultural Statistics
of Uttar Pradesh</u>, Department of Agriculture, Govt. of U.P.

of different factors for various crops by the area under
these crops. For the crops for which per hectare esti-
mates were not available, average per hectare estimates
of the crops covered by FMS and comprehensive scheme
have been used for Period I and II respectively. As FMS
(1966-69) could be used to prepare factor income esti-
mates for the years 1966-67, 1967-68 and 1968-69 only,
in order to obtain factor income estimates prior to
1966-67 information available from Farm Management study
(1954-57) in U.P.[13] has been utilized. Shares of labour
and capital for the years 1960-61 to 1965-66 have been
obtained by observing the changes in shares between
1954-57 and 1966-67 and distributing the total change
uniformly over the years. As FMS (1954-57) did not in-
clude rental value of owned land in the total cost of
the included crops, per hectare value of land in 1966-67
has been moved backward, with the help of index of total
area sown and index of wholesale prices of agricultural

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[13]Studies in Economics of Farm Management in Uttar
Pradesh, Combined Report (1954-55 to 1956-57), Directorate
of Economics and Statistics, Ministry of Agriculture,
Govt. of India.

commodities in the State. Similarly in Period II also, gaps in factor income estimates for the years for which comprehensive scheme data could not be available, have been filled up, by using the observed trends in the movement of per hectare shares between the years for which data are available.

As agricultural sector in the State includes acti- vities of State irrigation works also, estimates of wages and salaries and interest in the case of public irriga- tion have been obtained from annual administration reports of the Irrigation Department, U.P.[14] In case of irrigation works, share of land has been assumed to be negligible.

Absolute shares of wages, interest and rents in case of crop production including irrigation have been presented in Table III.1

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[14] Uttar Pradesh Sinchai Vibhag Ka Karyapurti Digdarshak, Department of Irrigation, Govt. of Uttar Pradesh (different issues).

Table III.1 :   Factor Shares in Crop Production*

(in crore Rs.)

Period	Wages	Interest	Rent
1960-61	312.41	96.58	327.97
1961-62	325.99	116.79	344.80
1962-63	330.75	134.87	337.62
1963-64	339.71	153.53	391.05
1964-65	349.09	173.60	576.12
1965-66	356.01	191.52	562.04
1966-67	343.67	200.09	711.94
1967-68	381.32	207.83	943.95
1968-69	378.58	218.26	901.52
1969-70	503.77	248.83	945.45
1970-71	635.03	291.96	1024.77
1971-72	755.00	330.44	1085.67
1972-73	877.68	370.97	1149.70
1973-74	1005.00	413.54	1222.59
1974-75	1123.70	452.82	1279.18
1975-76	1231.97	464.32	1485.85
1976-77	1145.02	523.91	1508.67
1977-78	1402.36	529.01	1300.61
1978-79	1441.85	533.62	1571.67
1979-80	1178.28	649.55	1361.38
1980-81	1585.45	812.58	1894.58

Source :   See the text and Appendix B & B_1.

* Includes irrigation also.

1.2.1(b) <u>Shares of Major Factors in the Animal Husbandry</u>

<u>Sub-sector</u> : As there are various problems in the alloca-

tion of costs between agriculture (crop production) and

livestock activities which are usually carried together,

the subject of preparation of factor shares for the animal

husbandry sub-sector has remained relatively unexplored.

In what follows an attempt has been made to provide

estimates of major factor incomes (i.e. absolute shares

of labour and capital) in this sub-sector. The assumption

that shares of factors in the value added are equal to

the shares of factors in the total cost holds good for

this sub-sector also as in the case of crop production.

Output of the animal husbandry sector consists of a

number of group of products such as : (i) milk and milk

products, (ii) meat and meat products, (iii) eggs and

poultry, (iv) hides and skin, (v) wool and hair, (vi) dung,

(vii) bones, (viii) increment in livestock, and (ix) other

products.[15] However, nothing substantial is known about

the value of labour and capital involved in the production

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[15]<u>Methodology of State Income Estimates of Uttar</u>
<u>Pradesh</u> (revised series), Economic and Statistics Division,
State Planning Institute, U.P., 1977, p.13.

of these products except milk. Even for milk, production
data are neither current nor regular. Yet, as milk and
milk products occupy the most prominent place in the
gross value from this sector,[16] stray information availa-
ble about the milk economy has been used as the basis,
for evaluating factor shares for the sector animal hus-
bandry.

1.2.1 (b-1) Shares for Milk Production : As mentioned
earlier data for milk production in the State are rather
scarce, except from a few farm management studies, and
a few cattle surveys, which provide some information
about the cost of milk production. Fortunately the two
studies of Deoria and Muzaffarnagar which have been used
for estimating labour and capital component in case of
agriculture contain some information on various aspects
of maintenance cost of cows and she buffaloes also. This
information has been used for estimating labour and
capital components in case of milk production. As the

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[16] Working Sheets of the State Income Estimates,
Economic & Statistics Division, State Planning Institute,
Lucknow (Uttar Pradesh) show that milk and milk products
account for the major share of the gross value of animal
husbandry. Percentage share for 1960-61, 1970-71 and
1980-81 are 72.87, 66.48 and 72.58 respectively.

studies provide cost of maintenance of milched animal
for agricultural households only (having some cultivable
land), we have assumed that cost of maintaining milched
animals for the non-agricultural households would be the
same as for the agricultural households. While the
assumption may not be perfectly true, the number of mil-
ched animals with the non-agricultural households being
too small in comparison to the agricultural households,
our results are not likely to err to a questionably large
extent.[17]

Share of labour per cow and per she-buffaloe ob-
tained from FMS has been multiplied by the number of
milched cows and she-buffaloes in milk,to get the total
share of labour in milk production for years 1966-67,
1967-68 and 1968-69. Estimated share for 1966-67 has
been moved backward and that of 1968-69 forward, with
the help of total number/of milched cows and buffaloes and
the index number of average wages of other agricultural
labour in the State.

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[17] According to 1972 Livestock Census about 96.24
per cent of the total milched buffaloes and 97.06 per
cent of the total milched cows were in the rural sector
of the State and as most of the household in the rural
sector are agricultural household, having some cultiva-
ted land, our assumption is not likely to take us too
far from the reality. See, Livestock Census of U.P.
1972, Directorate of Economics & Statistics, Ministry
of Agriculture, Govt. of India.

Share of capital in milk production for the years
1966-67, 1967-68 and 1968-69 has been estimated by multi-
plying the interest charges per cow and per she-buffaloe
by the total number of milched cow and buffaloes in the
State in the respective years. In order to obtain esti-
mates for years 1960-61 to 1965-66 it has been assumed
that percentage change in the share of capital in this
sub-sector would be the same as in crop production during
1960-61 to 1966-67. Per cow and she-buffaloe capital
component thus worked out for 1960-61, has been multiplied
by the number of milched cow and buffaloe in the year, to
derive total capital share in milk production in 1960-61.
Per milched animal estimates for the intervening years
have been obtained by distributing uniformally over the
years, total percentage change in the capital share per
milched animal between 1960-61 and 1966-67. Estimates so
derived have been multiplied by the total number of .
milched cows and buffaloes in the respective years to
get the share of capital for years between 1960-61 and
1966-67. Same procedure has been used to obtain the share
of capital for the years 1969-70 to 1980-81.

As in NAS,[18] share of land in the animal husbandry sector is assumed to be negligible. Absolute share of labour and capital so worked out are given in Table III.2 (for detailed methodology of preparing these shares see Appendix B_2).

Table III.2 : Factor Shares for Milk Production

(In crore Rs)

Period	Wages	Interest
1960-61	33.55	9.71
1961-62	38.49	11.52
1962-63	37.98	13.33
1963-64	32.98	15.09
1964-65	49.89	16.83
1965-66	42.69	18.57
1966-67	61.34	20.81
1967-68	71.42	22.62
1968-69	63.40	38.59
1969-70	81.91	33.50
1970-71	84.88	39.45
1971-72	92.65	45.62
1972-73	104.73	52.10
1973-74	126.32	58.68
1974-75	103.37	65.65
1975-76	161.51	72.89
1976-77	178.65	74.42
1977-78	195.17	76.40
1978-79	199.62	77.54
1979-80	218.08	100.14
1980-81	239.99	128.14

Source : See the text and the Appendix B_2.

[18]National Accounts Statistics, Published by C.S.O. Department of Planning, Govt. of India, New Delhi.

1.2.1(b-2)   <u>Shares of Factors in Case of Non-milk Products</u>:
Besides cow and buffalow milk there are certain other pro-
ducts like meat, eggs and poultry, hides and skins, wool
and hair and bones etc. which are contributed by different
categories of livestock.   Since there are no detailed
studies which could provide us information about the labour
and capital used in rearing these other types of livestock
and in the operational cost associated with the production
of these products, the entire population of livestock
relevant for this purpose has been converted into milch
cow equivalents with the help of cattle equivalence ratio.[19]
These numbers have then been multiplied by labour and
capital component per cow (as obtained from FMS for milk
production) to obtain total labour and capital component
in case of non-milk products (see Appendix B_3).

Total labour (wages and capital (interest) component
in case of non-milk products have been shown in Table III.3.

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[19]The cattle equivalence ratio refers to the scale of
converting different categories of animals (including
poultry) in terms of cattle on the basis of their average
feed consumption. See, <u>Methodology of State Income Estima-
tes</u> (revised series), op. cit., p. 20.

Table III.3 :   Income Shares in Non-milk
                Products

(in crore Rs)

Period	Wages	Interest
1960-61	6.34	1.05
1961-62	7.34	1.26
1962-63	7.22	1.44
1963-64	6.37	1.66
1964-65	9.72	1.87
1965-66	8.38	2.07
1966-67	12.90	2.21
1967-68	10.99	2.16
1968-69	11.30	2.60
1969-70	10.24	2.60
1970-71	13.10	3.00
1971-72	13.06	3.28
1972-73	14.32	3.82
1973-74	17.13	4.38
1974-75	20.73	4.99
1975-76	26.32	5.63
1976-77	27.37	5.83
1977-78	30.90	6.03
1978-79	34.22	6.22
1979-80	34.59	7.93
1980-81	39.63	10.58

Source :   See the text and Appendix B_3.

Having now prepared estimates of the shares of labour,
capital and land for the two sub-sectors agriculture (crop
production) and animal husbandry, we add them together and
subtract from the net value added figures available from
Economic & Statistics Division, SPI, to obtain the estima-
tes of profit, the share of the fourth factor - enterprise.
Shares of the four factors land, labour, capital and enter-
prise have been shown in Table III.4.

Table III.4 :   Factor Incomes in the
               Agricultural * Sector

(in crore Rs)

Years	Wages	Interest	Rents	Profit
1960-61	352.30	107.34	327.97	300.66
1961-62	371.82	129.57	344.86	265.12
1962-63	375.95	149.64	337.62	221.15
1963-64	378.92	170.28	391.05	294.93
1964-65	407.08	192.30	576.12	626.32
1965-66	407.08	212.16	562.64	590.86
1966-67	418.20	223.11	711.94	848.17
1967-68	463.74	232.94	943.95	950.79
1968-69	453.28	252.30	901.52	593.36
1969-70	595.92	284.93	945.45	540.68
1970-71	733.01	334.41	1024.77	393.78
1971-72	864.75	379.34	1085.67	197.82
1972-73	996.73	426.89	1149.70	769.87
1973-74	1148.45	476.58	1222.59	941.11
1974-75	1247.80	524.18	1276.18	1134.06
1975-76	1332.45	542.84	1485.85	304.35
1976-77	1449.20	604.36	1508.67	759.89
1977-78	1628.44	611.44	1300.61	1337.40
1978-79	1675.09	617.38	1571.67	870.80
1979-80	1430.95	757.62	1361.38	949.01
1980-81	1865.07	951.30	1894.58	2178.54

Source :   Tables III.1, III.2, and III.3.

* Includes State Irrigation Works also.

1.2.2 <u>Factor Shares for Other Sub-sectors in the</u>
<u>Primary Sector</u> : The sectors forestry and fisheries
are not very important sectors so far as their con-
tribution to the net value added in the State is con-
cerned.[20] Further, availability of data for these
sectors to estimate factor shares at the State level
is highly limited. No attempt has therefore been
made to prepare independently factor income estimates
for these sub-sectors. Instead shares have been pre-
pared from all-India percentage share of the factors
on the basis of NAS data. NAS however, provides five
categories of factor incomes : (i) compensation to
employees, (ii) interest, (iii) rent, (iv) profits, and
(v) mixed incomes of the self-employed persons.[21]

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[20]During 1970-71 to 1980-81 percentage contribu-
tion of the forestry sector to total SDP in the State
ranged between 1 to 1.5 per cent. and that of fisheries
between 0.1 to 0.2 per cent. See, Table 7, <u>Bulletin</u>
<u>No.199, State Income Estimates of U.P., 1970-71 to</u>
<u>1982-83</u>, Economic and Statistics Division, State Plan-
ning Institute, U.P.

[21]See, different issues of <u>National Account Sta-</u>
<u>tistics</u>, op. cit.

In the absence of any scientific basis, incomes
of the self-employed persons at any point of time have
been split up using overall current ratios (excluding
mixed income) between labour and property.[22] Percen-
tage share of factors so worked out at the all-India
level are used to obtain estimates of the shares of
labour and capital (including profit), assuming share
of land in these sectors to be negligible.[23] These
estimates are given in Table III.5.

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[22]Uma Datta Roy Choudhury, "Income Distribution
and Economic Development in India since 1950-51", The
Indian Economic Journal, Vol.25, No.2, 1977, pp.140-
164.

[23]While for the fisheries sector, it may be pre-
sumed that land as such i.e. without any investment
has no value importance of land for the forestry
sector can not be overlooked, especially when area
under forests in the State has increased by 35 per
cent between 1960-61 to 1980-81. However, as the land
area in the State is increasing not only from economic
point of view, but also due to several non-economic
reasons, such as, effecting the timely rains, checking
the soil erosion, preserving the wildlife, maintaining
ecological balance, a precise measure of the share of
land in the net income from the forestry sector is not
possible. Hence entire non-labour share under this
sector is assumed to constitute the share of capital.
For area under forest, see, Statistics of Land Utili-
sation in U.P. in Statistical Diary of Uttar Pradesh,
Economic & Statistics Division, State Planning Insti-
tute, U.P. (different years).

Table III.5 : Factor Shares in Forestry
and Fisheries Sector in U.P.

(Rs. in crore)

Years	Forestry		Fishery	
	Share of Labour	Share of Capital	Share of Labour	Share of Capital
1960-61	3.70	14.29	1.12	0.13
1961-62	4.34	16.21	1.04	0.12
1962-63	5.29	19.79	1.41	0.17
1963-64	6.15	21.07	1.58	0.21
1964-65	6.83	23.28	1.83	0.19
1965-66	10.56	32.38	1.97	0.25
1966-67	11.38	32.73	3.61	0.38
1967-68	12.48	37.35	4.61	0.31
1968-69	13.90	41.50	5.07	0.40
1969-70	15.63	43.36	4.34	0.29
1970-71	19.16	44.99	5.05	0.31
1971-72	16.97	50.93	6.30	0.61
1972-73	20.88	51.77	7.36	1.40
1973-74	28.12	58.86	8.69	1.58
1974-75	25.88	59.00	10.37	1.62
1975-76	25.13	59.15	12.99	2.31
1976-77	22.55	57.05	12.87	2.23
1977-78	31.32	75.03	14.40	2.43
1978-79	32.93	82.18	16.46	2.46
1979-80	37.47	87.64	18.62	2.66
1980-81	43.59	100.22	21.96	3.46

Source : See the text.

In order to obtain factor income estimates for the
primary sector, factor-wise income estimates given in
Tables III.4 and III.5 have been combined together.
Keeping in view the fact that profit in agriculture
accrues to the owner cultivator families by way of par-
ticipation income, profit and wage incomes have been com-
bined together to form the share of labour. Income
shares of labour, capital and land in the primary sector
have been presented in Table III.6.

Table III.6 : Factor Shares in the Primary
Sector (U.P.)

(in crore Rs)

Years	Labour	Capital	Land
1960-61	657.58	121.76	327.97
1961-62	642.32	145.90	344.86
1962-63	603.80	169.60	337.62
1963-64	681.58	191.56	391.05
1964-65	1042.06	215.77	576.12
1965-66	1011.07	244.79	562.04
1966-67	1281.36	256.22	711.94
1967-68	1431.58	270.60	943.95
1968-69	1065.61	294.20	901.52
1969-70	1156.57	328.58	945.45
1970-71	1151.00	379.71	1024.77
1971-72	1085.84	430.88	1085.67
1972-73	1794.84	480.06	1149.70
1973-74	2126.37	537.02	1222.59
1974-75	2418.11	584.80	1279.18
1975-76	1674.92	602.30	1485.85
1976-77	2244.51	663.64	1508.67
1977-78	3011.56	688.90	1300.61
1978-79	2595.28	702.02	1571.67
1979-80	2436.05	847.92	1361.38
1980-81	4109.36	1054.98	1894.58

Source : See the text.

1.3 Factor Shares in the Secondary Sector

The secondary sector comprises of mining, registered and unregistered manufacturing, construction, power, gas and water supply. Except the two sectors mining and construction, where all India percentage shares of factors have been used to work out shares of factors in the State, in all other sectors, shares have been prepared with the help of State level information. Sector-wise availability of data and methodology used for preparing factor shares is discussed below.

1.3.1 Mining : In case of mining sector information available at the State level is rather inadequate. Current and regular statistics available in this sector relates to value of mineral produce only.[24] Some stray information about average earnings of workers working under and above mines is also available from Director Genral of Mines and Safety[25] which proves rather insufficient for carrying State level estimation of factor

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[24]Mineral Statistics of India, Indian Bureau of Mines, Ministry of Steel and Mines, Govt. of India, different issues.

[25]Indian Labour Statistics, Labour Bureau, Govt. of India, different issues.

shares under this sector. However, the State being poorly
endowed with mineral wealth,[26] the contribution of this
sector to income of the State is also not very high[27] and
use of all India percentage shares to work out factor
shares in this sector, is likely to make no significant
difference in the relative shares of factors in the secon-
dary sector and overall factor shares of the State eco-
nomy. Factor shares prepared for this sector on the
basis of percentage shares of factors at all India level
with the help of NAS data have been presented in Table
III.7.

1.3.2 Unregistered Manufacturing : Due to the scattered
nature of economic activity in this sector, spread all
over the rural and urban areas, and prevalence of house-
hold enterprises which do not usually maintain income and
expenditure accounts, regular statistics under this sec-
tor are not collected by any official or private agency.

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[26]Techno-Economic Survey of Uttar Pradesh, National
Council of Applied Economic Research, April 1965, pp.90-
97.

[27]During the entire period of 20 years from 1960-61 to
1980-81 percentage share of the mining sector in total
SDP has ranged between .09 per cent and .2 per cent only.
See, State Income Estimates in Uttar Pradesh, Bulletin
No.161, 175 and 199, Economic & Statistics Division, State
Planning Institute, U.P.

Only sources of information in this sector are sample surveys carried out by National Sample Survey Organisation (NSSO), the data collected under the centrally sponsored scheme on survey of small scale industries and all India report on the Census of small scale units. NSSO covers only the self-employed households in rural and urban sector.[28] The latter two sources also, have a restricted coverage and cover urban areas only. Further, as all these sources provide information with a lag of five to six years, even value added figures in this sector are prepared by moving forward the bench mark estimates, with the help of different indicators.

Besides all the data constraints which render estimation of value added and factor income estimates under this sector difficult, the value added per worker approach used for preparing income estimates creates

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[28]However in its 29th round the NSSO has covered all the 'manufacturing units' not registered under the Indian Factories Act 1948. See,

(i) Tables with Notes on Survey of Self-Employed Households in Non-agricultural Enterprises, July 1974-June 1975, Report No. 280/3, 29th Round, NSSO, Aug. 1978.

(ii) S. Banerjee and P.K. Basak, "Survey Design for an Enquiry on Self-employment in Non-agricultural Enterprises, NSS 29th Round", Sarvekshana, Vol. 11, No. 4, April 1979, p. 135.

further problems in preparing factor income estimates
for, a significant proportion of the output in this
sector originates in the self-employed own account
enterprises where ownership of all the factors of pro-
duction rests with the family firm. In such a case,
split-over of value added, according to the services
rendered by factors in generating output, becomes
difficult.

Unlike other sectors, in this sector, the share
of capital has been obtained first, and the share of
labour has been obtained thereafter as a residual.[29]
In order to work out share of capital, the value of
capital stock in this sector for 1974-75 has been ob-
tained from the NSS 29th Round.[30] To obtain capital
stock figures for other years, capital-output ratio
for 1974-75 has been moved to other years on the basis
of index of capital output ratio in the registered
manufacturing sector of the State. Main assumption

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[29]For all the years, share of labour has been ob-
tained by subtracting the share of capital from the
estimate of net value added in this sector.

[30]"Tables with Notes on Survey of Self-employed
Households in Non-agricultural Enterprises, July 1974-
June 1975", op. cit.

underlying this exercise is that during the reference period 1960-61 to 1980-81, capital-output ratios in the unregistered manufacturing sector move parallel to the capital output ratios in the registered manufacturing sector of the State (for details see Chapter V of the thesis). With the help of capital-output ratios and the net value added figures, capital stock figures for other years are worked out.

In the absence of any reliable information on the rate of interest on capital in this sector, a notional rate of 15 per cent per annum, same as the average current rate of interest, has been applied to evaluate the income from capital stock.

1.3.3 Registered Manufacturing : In case of organised manufacturing, share of labour has been prepared with the help of ASI data which provides annual figures of wages and salaries and other emoluments paid to labour. However as ASI data includes - power, water supply and some service industries like sanitation also, due care has been taken to exclude them while preparing share of labour for the registered manufacturing sector. Care has also been taken to account for the non-responding units under ASI.

Since complete reports of ASI covering both the Census
and sample sectors in the State are available from
1967 only, for earlier years information available from
ASI Census sector and NSSO reports for the sample sec-
tor has been pooled. Share of capital for all the
years, has been obtained as residual after subtracting
share of labour from the value added figures, prepared
by Economic and Statistics Division, SPI, Lucknow. Esti-
mates so prepared have been shown in Table III.7.

1.3.4 Construction : The sector is badly equipped
with statistics needed for preparing broad economic
aggregates like factor shares and value added. Acute
shortage of relevant statistics in this sector is ob-
vious from the fact that this is the only sector where
expenditure approach is used for preparing income
estimates, while in all other sectors of the State eco-
nomy either production or income methods are used.
Although, the sector has a wide coverage and includes
the construction activities of the Central and the
State Governments, their departmental and non-depart-
mental enterprises, local bodies and the private

sector; but information on compensation to employees interest etc. is not available for many of these agencies. Even figures of total expenditure on construction are not readily available for many departmental and non-departmental units of the Central Govt. Such as Railways, Post and Telgraph and the Life Insurance Corporation, which do not provide state-wise break-up of the construction work for projects extending across the State boundaries.[31] In case of the household sector, no regular statistics, official or unofficial, relating to the construction work is available either for rural or for urban areas in the State. Due to these problems, it has been presumed that factor income shares in this sector would be largely the same as all-India. Estimates prepared for this sector on the basis of percentage share of factors worked out from NAS data for the national economy have been presented in Table III.7.

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[31]D. N. Chaturvedi, "Problems of Estimating Gross Fixed Capital Formation at the State Level" in the Journal of Income and Wealth, Vol.4, No.1, January 1980, pp.23-25.

1.3.5 <u>Power, Gas and Water Supply</u> : The Principal Organisation in the Electricity sector in the State is U.P. State Electricity Board (UPSEB). Besides the Board, there were also some municipalities which generated and distributed power upto 1976-77. Some private companies are also working in the sector. Share of labour has been estimated for the Board, municipalities and companies separately and added together to form the share of labour in this sector. Data for preparing labour's share in case of UPSEB have been obtained from its Annual Accounts for all the 20 years of the study. However, in case of companies and municipalities, information on wages and salaries and other benefits etc. for the State were not available. These have been estimated from the all India information in this respect available from the Annual Reports of the Central Electrical Authority of India. For this purpose, value added by municipalities and companies in the country was worked out following income approach. Value added in the State was then obtained as forming same percentage of value added as the percentage of share of energy sold in the State

in the total energy sold by these companies and muni-
cipalities in India. Share of labour in value added
for municipalities and companies in the State has then
been worked out (using same percentage as all India).

In case of water supply, share of labour has been
worked out on the basis of ASI data. Share of labour
in electricity and water supply (production of gas in
the State being negligible) have been added for all
the years. Same have been subtracted from the value
added figures for this sub-sector to find out the share
of capital.

Estimates of power, gas and water supply sector
alongwith shares in other sub-sectors of the secondary
sector have been presented in Table III.7.

1.4 Factor Shares in the Tertiary Sector[32]

The tertiary sector includes transport, storage and
communication, trade, hotels and restaurants, banking

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[32]In preparing factor income estimates for the ter-
tiary sector, the subsector real estate and ownership
of dwellings falling under this sector has been exclu-
ded. Exclusion has been made due to the problems
associated with obtaining reliable estimates of capital
stock under this sector. For details see Chapter V of
the thesis.

Table III.7 : Factor Shares under Different Sub-
Sectors in the Secondary Sector

(in crore Rs)

PERIOD	Mining		Construction		Unorganised Manufacturing		Organised Manufacturing		Power, Gas & Water supply	
	Labour	Capital	Labour	Capital	Labour	Capital	Labour	Capital	Labour	Capital
1960-61	1.15	0.60	44.86	10.59	82.16	3.07	41.28	17.87	2.50	2.33
1961-62	1.66	0.73	54.01	13.44	89.72	3.43	46.19	19.99	2.94	3.42
1962-63	3.89	2.14	61.79	18.07	98.89	3.60	46.54	22.81	3.44	5.49
1963-64	5.11	2.79	72.93	19.67	112.28	3.89	42.68	26.01	3.40	4.74
1964-65	5.24	3.10	80.33	29.54	121.05	4.89	46.41	40.07	3.33	6.49
1965-66	5.53	3.19	100.03	32.79	123.84	5.58	53.54	45.12	3.37	8.90
1966-67	5.49	3.29	89.43	23.19	132.07	7.66	56.18	58.48	4.23	10.74
1967-68	6.95	3.31	110.63	20.03	148.88	7.35	53.87	56.07	5.95	10.45
1968-69	5.11	2.84	116.77	17.60	156.16	8.65	57.72	71.71	6.37	17.29
1969-70	5.02	3.11	134.29	20.60	165.17	13.86	97.27	94.93	9.41	20.16
1970-71	5.13	4.17	204.35	28.51	178.81	13.50	105.31	81.18	8.92	14.55
1971-72	4.67	3.53	210.06	35.94	187.00	13.20	115.63	67.42	9.87	17.62
1972-73	5.30	3.78	252.45	34.98	213.42	21.24	126.96	122.53	13.59	23.69
1973-74	7.59	3.75	267.65	58.25	227.57	23.15	139.29	148.50	18.59	10.04
1974-75	9.54	3.43	317.49	37.41	309.28	24.51	158.57	129.22	30.21	4.61
1975-76	10.15	4.18	344.49	53.40	332.17	23.91	192.18	136.55	36.04	25.40
1976-77	11.00	4.92	385.18	58.88	352.25	27.48	203.61	174.08	33.96	41.20
1977-78	13.66	5.00	450.23	79.89	457.84	32.40	234.19	211.21	39.23	14.20
1978-79	19.08	5.35	523.78	62.43	571.62	35.09	262.68	222.78	63.80	17.85
1979-80	16.70	8.69	541.00	599.39	663.79	41.23	332.33	237.99	63.12	122.30
1980-81	29.63	12.74	685.34	77.76	896.72	51.25	412.85	296.15	90.71	135.60

Source : See the text.

and insurance, public administration and other services. In all these subsectors comprising the tertiary sector, shares have been worked out assuming the same percentage shares for different sub-sectors as in case of all India obtained from NAS. Shares of different sub-sectors so worked out are added separately for labour and capital to obtain the factor income estimates for this sector presented in Table III.8.

Table III.8 : Factor Shares in the Tertiary Sector (U.P.)

(Rs. in crore)

Years	Share of Labour	Share of Capital
1960-61	338.75	122.01
1961-62	381.72	111.33
1962-63	395.18	150.30
1963-64	415.25	159.18
1964-65	452.42	164.75
1965-66	508.75	181.67
1966-67	581.65	191.13
1967-68	680.09	221.30
1968-69	753.80	240.92
1969-70	818.66	254.37
1970-71	746.54	180.01
1971-72	811.73	216.85
1972-73	868.44	254.66
1973-74	1019.14	258.16
1974-75	1319.14	347.65
1975-76	1451.45	398.05
1976-77	1634.43	578.20
1977-78	1955.75	645.70
1978-79	2074.75	675.12
1979-80	2343.95	732.51
1980-81	2888.88	898.50

Source : See the text.

In order to prepare factor income estimates for the State (all sectors excluding real estate and ownership of dwellings) estimates of shares of labour capital and land[33] under the three sectors viz. primary, secondary and tertiary have been added up separately. Resulting estimates are presented in Table III.9.

Table III.9 : Factor Shares in Value Added in U.P. (all-sectors)

(In crore Rs.)

Years	Labour	Capital	Land	Value Added (current prices)
1960-61	1168.28	278.23	327.97	1774.48
1961-62	1218.56	298.24	344.86	1861.66
1962-63	1213.53	372.01	337.62	1923.16
1963-64	1333.23	407.84	391.05	2132.12
1964-65	1750.64	464.81	576.12	2791.57
1965-66	1805.92	522.65	562.04	2890.61
1966-67	2150.41	550.59	711.94	3412.94
1967-68	2437.95	589.11	943.95	3971.01
1968-69	2161.54	653.21	901.52	3716.27
1969-70	2289.12	832.88	945.45	4067.45
1970-71	2400.06	702.08	1024.77	4126.91
1971-72	2424.80	785.54	1085.67	4296.01
1972-73	3275.02	918.73	1149.70	5343.45
1973-74	3814.50	1015.22	1222.59	6052.31
1974-75	4562.34	1131.63	1279.18	6973.15
1975-76	4040.10	1243.78	1485.85	6769.73
1976-77	4864.94	1488.43	1508.67	7862.04
1977-78	6175.26	1664.59	1300.61	9140.46
1978-79	6110.99	1720.84	1571.67	9403.50
1979-80	6396.98	2090.46	1361.38	9848.82
1980-81	9113.49	2526.98	1894.58	13535.05

Source : Tables III.6, III.7 and III.8.

[33] Absolute share of land in the SDP (excluding real estate and ownership of dwellings) is assumed to be the same as in the primary sector.

Section 2 : <u>Trends in the Relative Movement of</u>
<u>Factor Shares</u>

2.1 <u>Analysis of Trends</u>

This section is devoted to an analysis of the trends
in the relative movements of factor income shares during
the period 1960-61 to 1980-81. For the purpose of ascer-
taining the trend, average percentage shares of factors
under different time periods, are worked out and presented
in Table III.10.

<u>Table III.10</u> : Average Percentage Shares of
Factor in Net Value Added :
All Sectors

	Periods	Labour	Capital	Land
I.	1960-61 to 1967-68	63.01	16.78	20.21
II.	1967-68 to 1974-75	60.62	17.20	22.19
III.	1974-75 to 1980-81	64.95	18.68	16.37
IV.	1960-61 to 1970-71	61.01	17.36	21.63
V.	1970-71 to 1980-81	63.80	18.34	17.86
VI.	1960-61 to 1980-81	63.19	18.10	18.70

(at current price)

Source : Table III.9.

Table III.10 shows a mildly increasing trend in the relative share of capital. Not-with-standing minor increase or decrease in the percentage share of labour during different time periods, its share during 1960-61 to 1980-81 is broadly the same as during 1960-61 to 1967-68 and during 1970-71 to 1980-81. This rather sticky share of labour over the two decades, suggests the 'constancy of labour share', a preposition discussed widely in economic literature.[34]

Percentage share of land, except for a rise during 1967-68 to 1974-75 over 1960-61 to 1967-68, depicts a decreasing trend throughout.

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[34]Statistical investigations by A.L. Bowley, E.H. Phelps Brown and P.E. Hart, and Colin Clark for the U.K. contributed to the view that share of labour in the national income remained stable over long periods. Kuznets study for the USA also confirmed that during 1907 to 1940 there occurred no remarkable change in the share of income going to labour, see :

(i) A.L. Bowley, The Change in the Distribution of National Income 1880-1913 in A.L. Bowley and Sir J. Stamp, Three Studies on the National Income, London, 1938.

(ii) E.H. Phelps Brown and P.E. Hart, "The Share of Wages in National Income," Economic Journal, June, 1952.

(iii) Colin Clark, National Income and Outlay, London, 1957.

(iv) S. Kuznets, Long-term Changes in the National Income of the United States of America since 1870, in S. Kuznets and R. Goldsmiths, Income and Wealth of the United States : Trends and Structure, Income and Wealth Series II, Cambridge, England, 1952.

Since changes in relative movements of income shares in the State economy (all sectors) occur due to changes in relative movements of income shares at the sectoral level, the analysis has been extended to broad sectors also. Table III.11 presents percentage share of factor incomes in the net output originating in the primary sector.

Table III.11 : Average Percentage Distribution of Factor Incomes : Primary Sector

Period	Labour	Capital	Land
I. 1960-61 to 1967-68	55.85	12.28	31.87
II. 1967-68 to 1974-75	50.77	13.72	35.51
III. 1974-75 to 1980-81	54.32	15.11	30.56
IV. 1960-61 to 1970-71	52.54	12.83	34.63
V. 1970-71 to 1980-81	53.00	14.99	32.01
VI. 1960-61 to 1980-81	52.77	13.91	33.32

Source : Table III.6.

A comparison of Table III.11 with Table III.10 reveals a close correspondence between the relative movement of shares in the primary sector and the aggregate economy. The reason lies in the fact that the sector weighs heavily both in terms of income and employment. This is evident from the fact that in 1980-81 share of this sector in State income (at current prices) was 50.03 per cent. Its share in total employment worked out to more than 75 per cent.[35]

Table III.11, like Table III.10 depicts a neat increasing trend in the share of income going to capital. Despite a decline of 5.12 per cent in the relative share of labour during 1967-68 to 1974-75, the share has almost regained its relative position in the subsequent period i.e., 1974-75 to 1980-81. Average percentage shares of labour worked out for the two decades, also reveal that, barring a marginal increase during seventies, the share has remained almost unchanged over the

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[35]See, State Income Estimates, Bulletin No. 199, op. cit., and Census of India 1981, Series 21 (U.P.), Part II, Special Reports and tables based on 5 per cent sample data.

period 1960-61 to 1980-81. Thus, primary sector also supports the constancy of labour share through time.

Though there has been a significant increase in the income share occuring to land during 1967-68 to 1974-75 compared to the earlier period (1960-61 to 1967-68), a declining trend is apparent from the Table III.11. The rather abrupt increase in the relative share of land during 1967-68 to 1974-75, has caused a decline in the relative share of labour during the same period, and has also left its impression on relative changes in income shares for the aggregate economy. For this some explanation seems necessary.

Relative changes in shares of labour and land can occur due to changes in relative growth rates in these inputs and relative changes in their prices. Available number of workers in 1961 and 1971 Censuses are not comparable due to the definitional changes and can not be used as such to measure the growth of labour input. An exercise to make the two Census concepts comparable yields 1.30 and 1.33 as average compound growth rates of the number of workers during 1960-61 to 1967-68 and during 1967-68 to 1974-75

respectively.[36] Average growth rates in net sown area
(including current fallow land) work out to .76 and -.12
per cent for the two periods respectively. Even if the
negative growth rate is discarded as being due to some
casual factor effecting the net sown area figures for
the terminal year only, the fact that growth in land
area was quite slow during the period 1967-68 to 1974-75
can not be ignored. Thus, in spite of a slow growth in
land area during 1967-68 to 1974-75 in comparison to
the rate of growth in the working force during this
period, a change of 3.84 per cent in the share of income
going to land points to the steep rise in land values
during this period in comparison to the earlier period.

A study of relative price movement is difficult
in the primary sector. Since land has no regular market
of sale and purchase, a precise measure of appreciation
in land values is not possible. In fact, land values
appreciate fast due to investment in land and increased
demand for food resulting from high population pressure.
However, if one takes irrigation as one of the factor

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[36]See Chapter IV of this thesis.

that increases productivity of land and causes land
values to rise fast, it is seen that the index of gross
irrigated area as percentage of gross sown area has
shown a greater increase during 1967-68 to 1974-75 as
compared to 1960-61 to 1967-68 and also 1974-75 to
1980-81 as shown in Table III.12.

Table III.12 : Index of Gross Irrigated Area
as Percentage of Gross Cropped
Area in U.P.

Period	Index	Percentage change over previous period
I. 1960-61 to 1967-68	100.00	-
II. 1967-68 to 1974-75	142.42	42.42
III. 1974-75 to 1980-81	174.38	22.44

Source : Agricultural Statistics of Uttar Pradesh,
Directorate of Agricultural Statistics,
Lucknow, various issues.

This perhaps provides some rough explanation as
to the relative increase in the income share going to
land during period II i.e., 1967-68 to 1974-75 causing
a relative decline in the share of labour during the

period and decrease in the share of land in period III,
and a corresponding increase in the share of labour.

A falling trend in the relative share of income
going to land in the period 1970-71 to 1980-81, reflects
that the nature of technological change during this
period has been land augmenting.

In order to assess the trends in the relative move-
ment of factor shares in the secondary and tertiary
sectors, relative shares under different time periods
have been presented in Table III.13.

Table III.13 : Average Percentage Distribution
of Functional Income in the
Secondary and Tertiary Sector

Period	Secondary		Tertiary	
	Labour	Capital	Labour	Capital
I. 1960-61 to 1967-68	77.72	22.28	74.50	25.50
II. 1967-68 to 1974-75	75.53	24.67	78.05	21.95
III. 1974-75 to 1980-81	78.42	21.58	76.43	23.57
IV. 1960-61 to 1970-71	74.43	25.57	75.44	24.56
V. 1970-71 to 1980-81	78.16	21.84	76.95	23.05
VI. 1960-61 to 1980-81	77.31	22.69	76.43	23.57

Source : Tables III.7 and III.8.

Table III.13 shows that the pattern of change in the relative shares of labour and capital during the three sub-periods between 1960-61 and 1980-81 is the same in the secondary sector as observed in the primary sector i.e. labour loosing its relative share to capital during 1967-68 to 1974-75 in comparison to the earlier period, and then again regaining it in period III so that relative percentage share of labour during the I and III periods are nearly constant. While decadal percentages worked out, exhibit an increasing trend,[37] relative share of labour during 1960-61 to 1980-81 is not significantly different from its average relative share during 1970-71 to 1980-81. Thus it can be concluded that, by and large, there has been no marked change in the share of labour during the two decades.

The pattern of movement in the relative income shares during Periods I, II and III in the tertiary

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[37]An analysis of the factors behind this increasing trend requires a detailed study of relative changes in different sub-sectors of the secondary sector such as organised and unorganised manufacturing, power etc. Limitations of time and data, do not permit such an analysis for the purpose of the present study. However, a general explanation can be given in terms of employment and earnings both of which have increased very fast during the decade 1970-71 to 1980-81 compared to the decade 1960-61 to 1970-71.

sector is different from the pattern of relative share movement observed in the secondary and primary sectors during these periods. For, while in both the sectors primary and secondary, relative share of labour shows a decline in Period II (1967-68 to 1974-75) in comparison to Period I (1960-61 to 1967-68), and a rise in Period III (1974-75 to 1980-81) as compared to Period II; in the tertiary sector relative share of labour has increased during Period II in comparison to Period I, and has declined in Period III in comparison to Period II. Despite all this, it is interesting to note that average percentage relative shares worked out for the two decades and for the period 1960-61 to 1980-81 do not reveal any substantial change.

2.2 Conclusions

Main conclusions emerging from the analysis of the relative movement in factor income shares in the economy during 1960-61 to 1980-81 can be summarised as :

1. By and large, the relative share of labour has remained constant at a level of nearly 63 per cent during the two decades, supporting the 'constancy of labour share' hypothesis.

2. The relative share of capital shows a
    mild increasing trend throughout the
    period.

3. Share of land is large relative to the
    share of capital all along. Share of
    land however shows a declining trend
    during the latter decade i.e. 1970-71
    to 1980-81.

4. Pattern of movement in the relative in-
    come shares in the primary sector is the
    basic determining factor of relative
    changes in income shares at the economy
    level.

5. Relative share of labour, both in the
    secondary and tertiary sectors, is large
    in comparison to its relative share in
    the primary sector. Both the sectors,
    while supporting constant share hypothe-
    sis by and large, exhibit a mild increas-
    ing trend in share of labour which is
    more pronounced in the secondary sector
    than in the tertiary sector. In compa-
    rison to these two sectors, percentage
    share of labour has been more sticky in
    the primary sector.

Appendix B

The purpose of this note is to provide some details
of the FMS data covering two districts Deoria and Muza-
ffarnagar used for the preparation factor income estima-
tes for the entire State.

Studies in the economics of Farm Management in Deoria
and Muzaffar Nagar included following crops :

Deoria   Muzaffarnagar

1. Paddy   1. Paddy
2. Wheat   2. Maize
3. Sugarcane   3. Wheat
                                4. Gram
                                5. Peas
                                6. Sugarcane

Factor shares have been prepared for all the six
crops included in FMS (Muzaffarnagar). For those crops
which were common in both the studies i.e. Deoria and
Muzaffarnagar factor shares have been prepared by avera-
ging the cost figures (per hectare) in the two studies.
Break-up of the input cost per hectare for the six crops
as obtained from the two studies for each of the three
years, 1966-67, 1967-68 and 1968-69 has been shown in
Tables B.1, B.2 and B.3 respectively.

Table B.1 : Input Costs per Hectare (1966-67)

(in Rs)

Crops	Wages	Interest	Rent	Intermediate inputs	Total cost
Paddy	132	69	380	296	871
Maize	97	89	389	236	811
Wheat	147	82	382	485	1096
Gram	108	88	472	352	1034
Pea	113	89	474	1362	1038
Sugarcane	378	132	393	794	1697

Sources : I) Studies in the Economics of Farm Management
in Deoria, Uttar Pradesh, combined report
1966-69, Directorate of Economics and Sta-
tistics, Ministry of Agriculture, Govt. of
India, Undated.

II) Studies in the Economics of Farm Management
in Muzaffarnagar District, Uttar Pradesh,
Combined report 1966-69, Directorate of Eco-
nomics and Statistics, Government of India,
1975.

Table B.2 : Input Costs per Hectare (1967-68)

(in Rs)

Crops	Wages	Interest	Rent	Intermediate inputs	Total cost
Paddy	184	80	422	254	940
Maize	124	85	545	162	916
Wheat	162	93	436	490	1181
Gram	76	69	543	236	924
Pea	70	67	437	232	952
Sugarcane	405	138	504	773	1820

Source : Same as Table B.1.

Table B.3 : Share of Labour, Capital and
Land in Total Cost

(in Rs)

Crops	Wage	Interest	Rent	Intermediate inputs	Total cost
Paddy	196	83	357	345	981
Maize	112	92	428	271	903
Wheat	161	88	353	646	1248
Gram	76	82	450	334	·942
Pea	67	86	439	304	896
Sugarcane	382	144	503	879	1907

Source :   Same as Table B.1.

In order to judge the reliability of these factor
income estimates obtained on the basis of FMS data it
seemed worthwhile to compare these figures with some
other studies in the State. Fortunately one farm mana-
gement survey report for the year 1968-69 carried out
by Economic & Statistics Division, State Planning Insti-
tute (hereafter referred as SPI study) was available
for this purpose. The study was conducted in four
districts of the State - Faizabad, Gonda, Bulandshahr
and Moradabad which are representative of eastern and

western regions of the state. Total cost per hectare
for five major crops in the study has been shown in
Table B.4.

Table B.4 : Total Cost Per Hectare of Major
Crops in the SPI Study

(in Rs)

Crops	Total Cost per Hectare
Paddy	626
Maize	466
Wheat	994
Pea	563
Sugarcane	1522

Source : Krishi Utpadan Ki Sanshipta Roop Rekha 1968-69,
(Hindi), Economic and Statistics Division, State
Planning Institute, U.P.

A comparison of the above figures with the figures
of total cost given in Table B.3 shows that cost figures
in the SPI study lie constantly below the figure given
by FMS study. The differences are too large to accept.
A closer investigation into the concepts used by SPI study
revealed that the study did not include imputed value of
owned land. Excluding rental value of owned land from
the FMS total cost figures, we find that total cost
figures become comparable in the two studies (Table B.5).

Table B.5 :   Total Cost Excluding Rental
Value of Owned Land

(In Rs)

Crops	SPI Study	FMS Study
Paddy	626	656
Maize	466	486
Wheat	994	915
Gram	-	8
Pea	563	468
Sugarcane	1522	1426

Source : Col.1 - SPI Study

Col.2 - FMS (Muzaffarnagar and Deoria).

While figures of the total cost in the two
studies now do not reveal large variations, yet
their exist large variations in the share of labour
in total cost in the two studies. Percentage and
absolute share of labour in the two studies have been
shown in Table B.6.

Table B.6 : Percentage* and Absolute Share
of Labour in Total Cost

(in Rs)

| Crops | SPI Study | | FMS Study | |
	Share of labour	Total Cost	Share of labour	Total cost
Paddy	262 (42)	626	196 (30)	656
Maize	203 (44)	466	112 (23)	486
Wheat	239 (24)	994	162 (18)	915
Pea	154 (28)	562	67 (15)	463
Sugarcane	411 (27)	1522	382 (27)	1426
All Crops	1269 (30)	4170	919 (23)	3946

Source : ' See the text.

* figures in parentheses represent percentage in total cost.

Table B.6 shows large variations in the share of
labour in total cost in the two studies : strangely
enough for all the crops except sugarcane in which both
the studies allocate same 27 per cent share of total
cost to labour, share of labour in FMS lies constantly
below the share of labour given in SPI study. If we in-
clude rental value of owned land in the total cost of
FMS study share of labour becomes all the more lower as
shown in Table B.7.

Table B.7 :   Share of Labour in Total Cost
                (including rental value of owned
                land) in FMS Study

Crops	Total Cost	Absolute share of labour	Percentage share of labour
	(In Rs)	(in Rs)	
Paddy	981	196	20
Maize	903	112	12
Wheat	1248	162	13
Pea	942	67	8
Sugarcane	1907	382	20

Source :   See the text.

Since both the studies have used same basis for
evaluation of family labour and hired labour, diffe-
rences in labour share in total cost in the two studies
were difficult to explain.

A careful study of the SPI study revealed that
some portion of the area sown under wheat, paddy, maize
and pea, was under-mixed cropping. The study also asser-
ted that in the absence of any scientific method of
allocation of area under mixed cropping total crop cost

incurred in crop production were assumed to be for the
principal crops. Thus it is expected that labour in-
put per hectare on these crops might have gone up espe-
cially in the case of small holdings on which mixed
cropping/is generally practiced. Saini[1] also observes
that crop mixing on small farms tends to increase labour
use per hectare. This also explains the reason as to
why the share of labour in case of sugarcane came out
to be the same in the two studies (for no crop was mixed
with sugarcane in the SPI study).

In the absence of any other study which could pro-
vide some evidence for the share of labour in total
cost we have no other alternative than to accept the
figures given by FMS. We have rejected SPI study as it
over-estimates the share of labour and also provides no
information about the shares of other two factors of
production - namely capital and land which have been
grouped in the study under "other miscellaneous expen-
ditures". Another and perhaps more strong justification

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[1]G.R. Saini, Farm Size Resource Use Efficiency and
Income Distribution, Allied Publishers Pvt. Ltd., Delhi,
1979, p.116.

for rejecting the SPI study in favour of FMS is that
SPI study relates to a single point of time and due
to heavy dependence of agriculture on monsoon and
wheather conditions in the State, the estimates are
likely to give biased results if the year during which
the study had been conducted happened to be abnormal.
FMS data on the other hand, has greater claim for re-
liability (being based on cost accounting method) and
provides figures for three consecutive years, average
of which can be satisfactorily used to ascertain the
trend in the movement of factor shares over-time, which
is our primary objective.

Appendix B₁

This methodological note describes the procedure
of preparing factor shares for crop production in the
State. In preparing these shares, our practice has
been to multiply per hectare estimates of different
factors for various crops included in FMS and compre-
hensive scheme by the area under those crops in the
State. For the crops for which per hectare estimates
were not available, average per hectare estimates of
the available crops have been multiplied by the area
covered by those crops (i.e. area covered by the crops
other than those included in FMS or comprehensive
scheme).

For each of the year 1966-67, 1967-68 and 1968-69,
we have first calculated per hectare shares relating
to each factor land labour and capital for the six
crops with the help of FMS Muzaffarnagar and Deoria
(see Tables B.1, B.2 and B.3). These per hectare factor
estimates have then been combined by using as weights
area under each of the six respective crops. Total so
arrived gives estimated shares of land, labour and
capital for the six crops in the respective years. For

the area covered by the crops other than the six crops
in the State, per hectare estimates of factor incomes
obtained as an average of the per hectare estimates of
the six crops, have been multiplied by the total area
covered by other crops in the State. Two sets of esti-
mates have been added together to get the total factor
estimates for the State.

While by the above excercise we have been able to
prepare factor estimates for the years 1966-67, 1967-68
and 1968-69, non-availability of comparable data prior
to 1966-67 posed difficult problems for calculating
factor estimates for the period 1960-61 to 1965-66.
There appeared to be two ways to overcome this problem -
one was to assume that for the years prior to 1966-67
percentage share of the three factors in the value added
was the same as during late sixties. The other way was
to obtain with the help of some indicator or with the
help of some studies, percentage change in respect of
each factor that has taken place during the period. For-
tunately we could get one FMS conducted by DES* in Merrut

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*Directorate of Economic and Statistics, Ministry of
Agriculture, Govt. of India.

and Muzaffarnagar districts of Uttar Pradesh during
1954-57. Both districts in the study being in the
western region, results of this study compare reasona-
bly well with the results obtained from FMS Muzaffar-
nagar. By comparing the two studies, we have first
calculated total percentage change in factor shares
during 1954-57 to 1966-67 in the western region of the
State. There being no study which could indicate per-
centage change in factor shares in the eastern region
of the State during the same period, we have assumed
that magnitude of total percentage change in the eastern
region would be the same as in the western region.
This, along with one more simplifying assumption, that
the total change in per hectare shares during 1954-57
to 1966-67 was distributed uniformly over the years,
has helped us to prepare per hectare estimate of factors
during 1960-61 to 1965-66. Multiplying these by total
area sown in these years, factor estimates for each
year have been obtained.

The year 1966-67 has been purposively selected to
compare with the average obtained for the period 1954-57
(instead of comparing 1954-57 average with 1966-69

average) because the year 1966-67 marked a turning
point in the State's agriculture, being the year
during which new agricultural technology using HYV
was introduced in the State. As application of this
new agricultural technology started yeilding results, by
1967-68, it appeared more logical to presume that factor shares
before 1966-67 i.e. from 1960-61 to 1966-67 would be
more inconformity with trends and changes that have
occured between 1954-57 to 1966-67.

While the two assumptions mentioned above, helped
us to estimate per hectare factor estimates during
1960-61 to 1965-66 in case of labour and capital, es-
timate for the third factor i.e. land could not be
made, as FMS (1954-57) did not include the rental
value of owned land. In order to obtain absolute
share of land in the value added per hectare, estimate
of land in 1966-67 has been moved backward with the
index of gross value of agricultural output and total
area sown in the State during years.

For the period 1975-76 to 1977-78 factor shares
have been prepared by using the data as available
under the comprehensive scheme. The crops considered

for this purpose are paddy, wheat, sugarcane and bar-
ley. Inclusion of crops and selection of years has
been guided primarily by the availability of data.
Factor shares for the years 1975-76, 1976-77 and 1977-
78 have been prepared, using the same procedure as for
1966 to 1969. Wherever data in respect of any crop for
any year were not available, average of the two years
or figures of the latest year as relevant have been
used.

For filling the gaps in the estimates of the fac-
tor shares between 1968-69 and 1975-76 we have used
the same technique and same assumption as we did in
period I, i.e., finding the total change in factor
estimates between 1966-69 (3 years average) and 1975-
78 (3 years average) and distributing it uniformally
over the years.

For the remaining three years i.e. 1978-79, 1979-
80 and 1980-81 information regarding all the four
crops was not complete. Figures of the latest relevant
year have been used to fill the gap.

Appendix B₂

METHODOLOGICAL NOTE

The farm management studies Deoria and Muzaffar-nagar provide gross and net maintenance cost along with its different components per cow and per she-buffaloe. On the basis of these studies labour and capital component (i.e. value of labour and capital used in maintenance per cow and per she-buffaloe), has been worked out for each of the three years 1966-67, 1967-68 and 1968-69.

In order to estimate the value of labour used in milk production, labour cost per cow and per she-buffaloe as available for each year 1966-67, 1967-68 and 1968-69 have been multiplied, by the number of milched animals over 3 years in milk, in the corresponding years. For the years prior to 1966-67 and after 1968-69, labour charges per milched animal obtained by taking average of the three years (1966-69), have been moved forward and backward with the help of relevant indicators.

The choice of the type of indicator used for the above purpose has been guided primarily by the factors that are expected to bring about changes in the total value of labour used in the upkeep of milched cattle in the State. These changes may occur on account of the following factors.

1. A change in the technology of upkeep of milched cattle.

2. Changes in the composition of population of livestock i.e. changes in the proportion of milched animals in the total population of cows and buffaloes.

3. Changes in the cost of acquisition of human labour brought about by changes in the wage rates of labour engaged in the upkeep of milched cattle.

As for the first, there is little evidence that the technology of cattle rearing has undergone any significant change during the period of our study mainly due to the fixed nature of work performed by human labour such as grazing, feeding, milching, cleaning and others. Thus, it appears reasonable to assume, that the amount of labour used in these activities would not change to any significant amount, unless there is some major change involving use of some mechanical devices which may substitute for labour in these activities. Such a major change during 1960-61 to 1980-81 is hard to conceive for a

backward agrarian economy like Uttar Pradesh.

Changes in the number of milched animals which bring about changes in the total labour component in milk production are taken due care of, by interpolating the bench mark estimates of the number of milched animals of the relevant category. As interpolation is based on the assumption of constant geometric rate of growth, the yearly figures arrived at may suffer from over-estimation or under-estimation on this account. As changes in the value of labour used in milk production are also expected to occur on account of changes in wage rates of labour used in these activities, the human labour component per cow and per she-buffaloe obtained as an average of the three years, have been moved to other years with the help of index of wages of other agricultural labour.

Estimates of Interest in the Milk Production

The FMS Muzaffarnagar and Deoria, give interest charges paid per cow and per she-buffaloe. While FMS Muzaffarnagar gives interest paid on fixed as well as

working capital, the FMS Deoria gives interest paid on
fixed capital only. As working capital in animal hus-
bandry is usually paid within the month or so, account
has been taken of the interest paid on fixed capital
only. Thus interest paid per cow and per she-buffaloe
in the two studies, have been averaged separately to
obtain the interest paid per cow and per she-buffaloe
during 1966-67, 1967-68 and 1968-69. These have been
multiplied by the number of milched animals of the
relevant category and the figures so obtained have been
added up, to get the estimate of interest for milk
production.

For estimating interest in milk production during
1960-61 to 1965-66, we have assumed the percentage
change in this sub-sector to be the same as in the case
of crop production. The assumption, though not based
on any statistical evidence may not be totally false,
as milk production and crop production activities are
usually carried side by side in the State. This to-
gether with the assumption of uniform increase in
capital's share over the years, has enabled us to pre-
pare per milched animal capital component during 1960-61

to 1965-66. Same procedure has been adopted to pre-
pare capital estimate for the period 1968-69 onwards.
Estimates of share of labour i.e. wages paid, and
interest, in case of milk production are given in
Table III.2 in the text.

Since FMS provide no information about payment
of rent in case of milched animal, the share of land
in this sub-sector is presumed to be negligible.

Appendix B₃

In order to estimate labour and capital component
in case of non-milk products we have first tried to
identify the population of livestock relevant for this
purpose. This consists of :

1. Buffaloe males over 3 years not in use
    for breeding or work.

2. Buffaloe female over 3 years not in use
    for milk or other purposes.

3. Cattle male over 3 years not in use
    for breeding or work.

4. Cows over 3 years not in use for
    breeding or work.

5. Goats

6. Pigs

7. Sheep

8. Poultry

These animals have been converted into the cattle
equivalence (milched cow) by using the following per-
centages of cattle equivalence.

Appendix B$_3$

Table .. B₃ Percentage Cattle Equivalence.

Sl. No.	Type of Cattle	Percentage cattle equivalence
1.	Buffaloe in milk and breeding bulls	133.30
2.	Cattle breeding bulls, cows in milk, buffaloe bulls not in work or use	100.00
3.	Cattle bulls not in use, dry cows not in work or use and buffaloe young stock	50.00
4.	Rural buffaloe and bulls for work	133.30
5.	Rural cattle working bullocks, cows for work	100.00
6.	Cattle young stock	33.33
7.	Sheep, goats and pigs	10.00
8.	Poultry	0.50

Animal used in Transport Industry

1.	Urban buffaloes & bullocks for work, horses, ponies and camels	266.70
2.	Urban cattle bullocks and mules	200.00
3.	Donkeys	100.00

Source : Methodology of State Income Estimates (revised series), op. cit., p.20.

While there may appear an element of over-estimation in considering total livestock population under category 3 and 4, but we presume that over-estimation if any would be offset by the under-estimation caused by not taking into account camels, horses and ponies, which provide bones, hides and skins and hair etc. to the animal husbandry sector.

A precise estimate of the human labour and capital cost, in the production of non-milk products is hard to make, due to the problems associated with a complete identification of the type of animal that contribute to the value of output in the non-milk sub-sector of the animal husbandry sector. This is due to the fact that some animals contribute in other industries also, and it is difficult to find out what proportion of the total cost used in their maintenance should be allocated to the animal husbandry sub-sector for e.g. horse, ponies and camels etc. which are used in the transport industry but who add to the value of animal husbandry after they are dead. In such a case estimation of labour and capital components for this part of the animal husbandry

sub-sector has to be based on some guess work, and
to that extent our figures may suffer from some degree
of over or under-estimation.

Chapter IV

GROWTH OF LABOUR INPUT IN UTTAR PRADESH

Growth of labour input during a given period of
time may be looked upon as a function of (i) changes
in the number of working force and in the alteration
of their sex-proportion and age-distribution, (ii)
changes in the length and pattern of employment due
to shift of labour from seasonal to non-seasonal em-
ployments, pressure of demand for output or national
emergency, or lock-outs, strikes, power break-downs
etc, and (iii) due to qualitative changes in labour
skill resulting from better training, education and
health improvements etc.

1. Choice of Measure

Measuring growth of labour input over different
years in a study seeking to analyse the productivity
of different factors bristles with problems.

Theoretical considerations call for a standard
which not only embodies all these changes, but ensures
an accurate measurement of each type of change. An
Attempt to evolve such a standard measuring unit does
not seem feasible.

For practicable purposes, however, two measures
are often used as an index of growth of labour input.
They are (i) number of workers, and (ii) man-hours
worked. The first concept does not take into account,
the time used in the production of total output, and
the effects of improvements in the quality of labour,
and the second does not take into account, changes
in the size and composition of the working force and
the contribution of improved skills.

In regard to the first concept it has been men-
tioned, "the concept of man-hours worked for or more
precisely man-hours paid for which includes hours not
worked such as reporting time, rest periods, sick-
leaves, holidays and paid voccations provide a more
useful measure of labour time required for production
within the existing institutional framework. They
also signify the gross amount of labour that must be
purchased for continued production".[1]

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[1]Kehar Sangha, _Productivity and Economic Growth_,
Asia Publishing House, London, 1964, p. 19.

But, the choice of a particular concept for the measurement of labour input in any study is guided very much by the availability of data and the relevance of that concept to the socio-economic set up of the region. Hence, despite the merits of 'man hours' concept mentioned above, it could not be used for the purpose of the present study.

Man hours 'worked for' or 'paid for' figures are not available for all the economic activities at the State or national level. Reliable figures are available only for the organised sector. For unorganised sector, data are largely unavailable. Though National Sample Survey Organisation (NSSO) has collected some data on 'hours worked' in a week in the agricultural sector, in its twenty-seventh and thirty-second rounds, but the concept of 'man hours worked' used by NSSO is unrealistic and meaningless due to the unstandarised nature of farm operations and lack of clarity in the conception of hours among the rural workers.[2] Not

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[2] J.N. Sinha, "Some Methodological Aspects of Employment" in Population Statistics in India, A. Bose, D.B. Gupta and G. Ray Choudhury (eds.), Vikas Publishing House, New Delhi, 1977, p.113.

only in the farm sector, but in other unorganised acti-
vities also, data on labour time disposition are
neither available nor relevant. This is because pro-
duction in this sector is scattered over a large number
of family based enterprises which usually do not hire
labour. All members of the family share the work in
varying degrees and all enjoy family income. In such
cases, due to lack of a well established relationship
between income and the work-load, and the work spread-
ing habits of the self-employeds, a precise count of
labour time in economically productive work, can hardly
be made on any scientific basis.[3] It has therefore
been argued that "the 'time' criterion is the legacy of
the 'labour-force' approach borrowed from the indus-
trialised countries. It has but limited relevance for
a part of the labour market where the work intensity
per unit of time as well as the productivity and the
labour's remuneration related thereto are standarised".[4]

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[3] "for hired casual labour, time disposition data
in terms of standard days or hours are more meaningful.
But for the self-employed, even the most precise count
of labour time spent in different activities may at
times be misleading...when there is not much work the
self-employed workers may reduce the intensity of work
effort but spread it over the whole day or week...the
survey investigator will count it as a full day or week
worked..... In serious cases of this sort, time measures
of employment fail, and we may have to resort to more
indirect measures with pre-specified norms of producti-
vity or consumption", Pranab K. Bardhan, Land, Labour and
Rural Poverty : Essays in Development Economics, Oxford
University Press, Delhi, 1984, p. 37.

[4] J.N. Sinha, "Some Methodological Aspects of Employ-
ment" in Population Statistics in India, op. cit, p. 113.

In the absence of requisite data we have decided to use the second concept viz. the 'number of workers' as an index of labour input. Denison has also favoured use of this concept as it is not effected by changes due to shortening of 'man-hour' per week, which is likely to effect labour input per hour.[5] The choise of 'number of working force' seems apt to U.P., the most populous State of the Indian Union, and one of the most economically backward and poverty ridden area. For such a State, containing a vast force of unemployeds increase in the numbers in the working force can be a meaningful determinant of economic growth.

Having decided to use the number of workers as an index of labour input, our next step is to look for the sources of data for this purpose. Although it is desirable to use current data on employment to measure annual changes in the estimates of the working force, such data for all sectors are not available. The only choice left is to rely on Census data, which is on decadal basis. Fortunately, our study period is comple-tely covered by the three Censuses 1961, 1971 and 1981

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[5] E.F. Denison, Sources of Economic Growth in the United States and the Alternatives Before Us, Supple-mentary Paper No.13, Committee for Economic Development, New York, 1962, p.36.

1961 and 1981 coinciding with the extreme points of the study period.

Before any use of Census data is made, it is better to point out that "the term working force refers to the number of persons engaged wholly or partly in the production of goods and services".[6] Measurement of the working force at any point of time, depends on a careful identification of the number of persons who actually contribute in the production of goods and services at that point of time. The problem of successful identification is handicapped by several conceptual difficulties in case of typically underdeveloped economies, where a bulk of production originates in family firms. As work is shared by members of the family, but not on strictly commercial basis, no regularity of time or wage is required. In such cases domestic and economic duties get intermixed, and it becomes difficult to distinguish persons, who perform economic duties and those, who do not. All appear employed, a sort of full employment prevails, and the problem of identifying those who

[6] National Account Statistics : Sources and Methods, Statistical Organisation Department of Statistics, Ministry of Planning, Government of India, April 1980, p.57.

might actually be called effectively employed, lends itself into the problem of measurement of disguised unemployment. As every one would consider himself actively participating in economic activity, the hypothesis of excessive labour use leading to zero, or to very low marginal product of labour, has often been advanced.[7] Even if it is assumed that the hypothesis does not hold true (as there are controversies attached to the hypothesis[8]), one can not certainly escape the problems of a clear distinction between those who participate effectively, and those whose participation may only be called marginal, unless, as Bardhan observes, "Some prespecified norms of productivity or consumption"[9] are set up.

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[7] (i) Ragnar Nurkse, "Excess Population and Capital Construction", <u>Malayan Economic Review,</u> October 1957, pp.1, 3-5.

(ii) J.W. Mellor and R.D. Steven, "The Average and the Marginal Product of Farm Labour in Underdeveloped Countries", <u>Journal of Farm Economics</u>, August 1956.

[8] (i) T.W. Shultz, <u>Transforming Traditional Agriculture</u>, Yale University Press, 1964.

(ii) T.W. Shultz, "Economic Growth From Traditional Agriculture", in <u>Economics of Underdeveloped Agriculture</u> Tara Shukla (ed.), Vora & Company, Bombay 1969, pp.1-21.

[9] Pranab K. Bardhan, <u>Land, Labour and Rural Poverty,</u> op. cit, pp.30-33.

As no such standard norms of productivity have yet been evolved, the problem of bringing within its purview all those who might be considered as economically active, has led the Census authorities (since 1961) to experiment with different concepts and definitions of worker. In consequence, the estimates of the working force thrown up by these Censuses remain largely uncomparable and can lead to misleading conclusions, if not used with extreme caution. When the purpose is to measure the growth in the working force during a specified time period, it is essential to ensure that strict consistency and comparability in the concept once adopted, is maintained throughout.[11] Hence in what follows, an attempt has been made to highlight the effects of changes in the concept and

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[10] For problems in comparability of Census data refer (i) J. Krishnamurthy, "Working force in 1971 Census : Some Excercise on Provisional Results", Economic & Political Weekly, Vol.VII, No.3, Jan.15, 1972, pp.115-118.

(ii) J.N. Sinha, "A Rationale View of Census Economic Data", Indian Journal of Industrial Relations, Vol.8, No.2, October 1972, pp.201-210.

(iii) J.N. Sinha, "1981 Census Economic Data : A Note", Economic & Political Weekly, Vol.XVII, No.6, Feb.1982, p.195.

(iv) Jaipal, P. Ambannavas, "Comparability of 1971 and 1961 Census Data", in Population Statistics in India, op. cit, pp.154-178.

(v) K. KShrinivasan & Des Raj, "Comparability of Data on "workers" in the 1961 and 1971 Census" in Population Statistics in India, op. cit, pp.138-153.

[11] E.F. Denison, Why Growth Rate Differ : Post-War Experience in Nine Western Countries, The Brookings Institution, Washington D.C., 1967, p.45.

definition of worker in the three Censuses. An excer-
cise to bring them to a comparable form has been made
in the next section.

2. Changes in the Concepts and Definitions of Worker

While every Census since 1961 adopted 'activity
status' or labour force approach for including or ex-
cluding any person in or from the work force, the very
criteria of ascertaining a person's activity status
has changed from one Census to the other. As a result,
marked deviations were noticed in the work participa-
tion rates both in the State and at the all India level.
Work participation rates in the three Censuses are set
out in Table IV.1.

Table IV.1 : Worker Participation Rates (UP)[12]

Years	Persons	Male	Female
1961	39.12	58.19	18.14
1971	31.14(30.94)	52.28(52.24)	7.10(6.71)
1981	30.80(29.13)	51.50(49.60)	9.52(5.39)

Sources[13] C i) Census of India, U.P., 1961, Part II-B(ii)
General Economic Tables, (ii) Census of India,
U.P., 1971, Part-II-B(ii) General Economic
Tables, (iii) Census of India 1981, Series 22
U.P., Primary Census Abstract.

[12]Figures in parenthes s are work participation rates
for principal workers in 1971 and main workers in 1981.

[13]Hereafter referred as Census of India, UP 1961,
1971 and 1981 only.

The worker participation rates reported by 1961
Census are the highest both for males and females
(Table IV.1).   A fall of 8 per cent in the work partici-
pation rates between 1961 and 1971 appears something
unusual.

The table further shows that worker participation
rates,[14] have improved marginally in 1981, though still
lying much below the 1961 level.   Neither any theoreti-
cal nor empirical evidence supports such a drastic
change in the activity pattern of the population.   It
is true that in developing agrarian economies, work
participation rates have a tendency to decline during
the early phase of economic development, even then it
is difficult to believe that the activity pattern of
the population that showed a decline of only 7.4 per-
centage points during 1911 and 1951, a period of forty
years,* would undergo so sudden and drastic change as
to lower the worker-population ratio by more than 8 per-
centage points in a period of a single decade.   It only
indicates, that the large differences in the WPR reported
by 1961 and 1971 Censuses are largely conceptual.   Let

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[14]Hereafter referred as WPR only.

* See Table IV.6 given in fool note on page 161.

us therefore look at the concepts and definitions
of workers as adopted in the three Censuses.

The 1961 Census adopted economically productive
work, as the criterion for including a person in the
work force. In case of regular employment, in trade,
profession, business service or commerce, a person was
to be counted as worker, if he remained employed during
any of the fifteen days, preceding the date of enumera-
tion. In case of seasonal work, some restriction upon
the entry into the work force was imposed, by setting
the criterion of regular work for more than one hour a
day, throughout the greater part of the working season.
However, this formulation was wide and vague. In the
absence of any clarity about the seasonality and regu-
larity of work, the criterion was unaccountably wide,
bringing within its ambit any one who has worked, no
matter with what usefulness, or with how much regularity.

On the other hand, 1971 Census adopted a rather
restrictive approach for categorising a person in the
work force. A person was enumerated as worker, if his
main activity was participation in any economically pro-
ductive work. In order to ascertain a person's 'main
activity', every person was asked as to how he engaged

himself mostly, during the reference period. In case

he spent his major time in economically productive

work in the reference period, he was enumerated as a

principal worker. In case of seasonal work, the

reference period was one year, and in case of regular

employment it was one week only.

The 1981 Census adopted a trichotomous classifica-

tion of workers— main workers, marginal workers and

non-workers. A person was enumerated as worker, if he

had worked any of the day, during the reference period

of last one year. All those categorised as workers, were

further recategorised into main and marginal workers.

Main workers were those, who worked for 'major part of the

last year i.r. 183 days or more, or at least six months,

the rest being termed as marginal workers.

The major time spent criterion used for principal

workers in 1971 and main workers in 1981, are nearly

the same.[15] As such, principal workers of 1971 and main

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[15]Although reference period used for ascertaining
a persons main activity differed in 1971 and 1981 Census
from working season to whole year in case of seasonal
employment, and one week to one year in case of regular
employment, these difference are not found to effect the
work participation rates to any significant extent. J.N.
Sinha has noted that work participation rates obtained
from various NSS rounds using different reference periods
reveal that fluctuations were not significant. J.N. Sinha,
"1981 Census Economic Data : A Note", op. cit, p.196.

workers of 1981, compare fairly well (Table IV.1).
However, they do not compare with 1961 Census estimate
of workers. Due to the adoption of 'major time spent'
criterion in 1971, all those working in economically
productive enterprises, but not for most of the time
in the year like old persons, students and unpaid female
workers, could not find place in the work force. These
were probably regarded as workers in 1961 under the
liberal criterion of one hour regular work. As most
of these workers were rural people, especially the un-
paid female labour, incomparability between 1961 and
1971 estimates of workers is more glaring in case of
females as revealed by Table IV.2.

Table IV.2 : Work Participation Rates of Males
and Females According to Rural
and Urban Residence

Years	Male		Female	
	Rural	Urban	Rural	Urban
1961	59.20	51.74	19.90	5.34
1971	52.98	47.85	7.27	3.10
1981	50.17	47.10	5.39	3.58

Source : Census of India, U.P. 1961, 1971 and 1981.

(For 1971 only principal workers and for 1981 only main
workers have been considered)

Work participation rates for urban females are comparable for the three Censuses (Table IV.2). However for rural females, work participation rates in 1971 is 12.63 per cent lower than that in 1961, although 1971 and 1981 are comparable (Table IV.2). This shows the possibility of enumerating as worker, unpaid rural females in 1961 who remained outside the work force in 1971, due to adoption of 'major time spent' criterion. However the extent of decline in WPR in 1971 as compared to 1961 is so large, that it can not be attributed only, to the under reporting of secondary activity in 1971.[16] What appears likely is, that the concept of 'main activity' prevented many working females who were spending their major time in economically productive work, from reporting themselves as workers. The social conventions, regarding house keeping as the main activity of the females, especially in rural areas, might be another factor.

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[16]Although enumerators in 1971 were asked to report the gainful secondary activity of non-workers but the count of secondary workers is too small and suggests that gainful activity of the non-workers was not enumerated fully (see Table IV.1).

In case of males also, 1961 WPR seems higher both in rural and urban sectors (Table IV.2). Some of the differential increase in 1961 might be due to the small percentage of school going children in 1961 as compared to 1971. To find out whether the differential increase in 1961 was due to enumeration of marginal workers, we have to see if male WPR in those age-groups where marginal workers are likely to be concentrated shows a greater decline in 1971 and 1981 as compared to 1961. Table IV.3 shows work participation rates for rural males in different age groups.

Table IV.3 : Work Participation Rates for Males According to Broad Age-groups and Rural-Urban Residence

Age-groups	Rural			Urban		
	1961	1971	1981	1961	1971	1981
0 - 14	9.30	5.82	4.60	3.79	3.23	2.30
15 - 59	94.54	88.59	87.03	83.63	77.90	74.67
60 & Above	88.06	83.26	77.47	65.94	65.84	57.49

Source : Census of India, U.P. 1961, 1971 and 1981.

(For 1971 only principal workers and for 1981 only ~~main~~ marginal workers have been considered).

For all the age groups under study, WPRs in 1971
and 1981 compare fairly well both in rural and in
urban areas. However in the age group 0-14 and 15-59
work participation rates for rural males in 1961 seem
higher compared to 1971. Though a part of high WPR in
1961 compared to 1971 in the age group 0-14 and 15-59
might be due to the rise in the percentage of school
and college going population in 1971 as compared to
1961 but some of it is likely due to enumeration as
workers, children and young persons in the age-group
0-14 and 15-59 although they were only marginal workers.
Due to the high weight acquired by the age group 0-14
in the total population,[17] any over-estimation of
participation rates in this age group is likely to
effect overall WPR to a greater extent.[18]

In case of urban males also WPR in the age group
15-59 seem higher in 1961 as compared to 1971, showing
the likelihood of enumerating marginal participants

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[17]According to 1961 Census, percentage share of
the age group 0-14 in total population was 40.48 per
cent.

[18]Overall work participation rate may be looked
upon as the weighted sum of the age specific WPR, weights
being the proportion of population in the respective age-
groups. B.H. Dholakia, Sources of Economic Growth in
India, Goods Companion, Baroda (India), 1974, p.86.

perhaps under 15-25 age group i.e. school-college

going population.

3.   Comparable Estimates of Workers : Adjustment
     in 1961 Census Estimates

The above discussion clearly shows that while

figures of main workers of 1971 and 1981 are comparable

for males and females, in both rural and urban areas,

the figures of 1961 Census are not. Hence to get a

meaningful idea about the change in the activity pattern

of the population, some adjustment in 1961 estimates

are required.

While a number of studies suggesting various methods

for bringing in comparability in 1961 and 1971 Census

estimates are available[19] the method followed in this

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[19] (i) J. Krishnamurthy, "Working force in 1971
Census : Some Excercise on Provisional Totals", op. cit.

(ii) J.N. Sinha, "A Rational View of Census
Economic Data", op. cit.

(iii) J.N. Sinha, "1981 Census Economic Data:A
Note", op. cit.

(iv) Jaipal P. Ambannavar, "Comparability of 1961
and 1971 Census Data", op. cit.

(v) K.N. Shrinivasan and Des Raj, "Comparability
of Data on 'workers' in the 1961 and 1971 Census", op.
cit.

study is based on the procedure suggested by the Re-
survey[20] and adopted by Central Statistical Organisa-
tion.[21]

Main assumption underlying the method used here
is that, the effect of conceptual difference in the
participation rates would be the same in the State, as
at the all-India level. Thus, 1961 estimates of workers
for different industrial categories in the State have
been multiplied by the ratio of actual to adjusted es-
timates of 1961 in the respective categories, at the
all-India level, available from C.S.O. Resulting esti-
mates, are the estimates of main workers in 1961, com-
parable to the Census concept of 1971 main workers.
Sex-wise break up for the adjusted work force in 1961
has been obtained by comparing the work participation
rates in different age groups in the 1961 and 1971
Census (for methodological details see Appendix C and
C_1),

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[20] Census of India, 1971, Report of the Resurvey on
Economic Questions - Some Results, Paper No.1 of 1974.

[21] National Account Statistics, op. cit., pp.59-64.

Work participation rates based on the comparable estimates of workers in the three Censuses have been shown in Tables IV.4 and IV.5.

Table IV.4 : Sex Specific Work Participation Rates in U.P. (based on comparable estimates of main workers only)

Years	Male	Female	Persons
1961	54.89	11.28	33.89
1971	52.98	6.71	30.94
1981	50.31	5.39	29.32

Source : See Appendix C and C_1.

Table IV.5 : Work Participation Rates for Male, Females and Persons According to the Rural-Urban Residence in U.P. (based on comparable estimates of main workers only)

Years	WPR in Rural Areas			WPR in Urban Areas		
	Male	Female	Persons	Male	Female	Persons
1961	55.40	12.10	34.62	48.23	5.334	29.02
1971	52.98	7.27	31.48	47.85	3.09	27.67
1981	50.99	5.90	29.72	47.30	2.99	26.99

Source : See the text, Appendix C_1 and Census of India 1961, 1971 and 1981.

It is observed from Table IV.4 that work partici-
pation rates in the State are quite low. During the
three decades on an average nearly 31.35 per cent of
the population has been working and supporting the
total population. Also, there are wide variations in
the work participation rates in rural and urban areas
(Table (IV.5). The root cause of such low levels of
participation rates in the State is very low partici-
pation rates found in the case of females. Female
participation rates vary between rural and urban areas,
being substantially higher in the rural than in the
urban areas. Due to relatively high female participa-
tion rates in rural areas, compared to urban areas,
overall participation rates in rural areas are also
higher as compared to urban rates.

A declining trend is observed in work participa-
tion rates, over the period 1961-81. The decline can
be traced back to 1911 when Census reported a worker
population ratio of 49.9 per cent.[22] Though figures

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[22]Table IV.6 : Work Participation Rates in UP

Year	WPR
1911	49.90
1921	52.12
1931	47.31
1951	41.50
1961	33.89
1971	30.94
1981	29.22

Source : Basic Statistics Relating to U.P. Economy 1950-51
to 1977-78, Economic & Statistics Division, State
Planning Institute, UP, 1979.

from 1911 to 1981 (Table IV.6 footnote) are not strictly
comparable due to definitional changes, yet, they con-
firm the largely accepted phenomenon of declining trend
in WPR during early stages of economic development.[23]
It is also to be noted that while during 1911 to 1951
WPR declined at a rate of 0.62 per cent per annum, the
rate of decline has slowed down since 1961. During
twenty years period 1961-81, WPR has declined at a
rate of 0.23 per cent per annum. The rate has further
slowed down during 1971-81. This shows the stabilising
tendency in WPR and possibilities of its becoming stable
and moving upwards in the future decade.

4. Growth of Labour Input : All Sectors

While WPR has declined during the three Census
dates there has inevitably been an increase in the
absolute number of workers as shown in Table IV.7.

Table IV.7 : Number of Workers

		(in '000)	
Years	Males	Females	Persons
1961	21028	3828	24856
1971	24562	2772	27334
1981	29590	2807	32397

Source : Appendix Table C_1.3 and Census of India
1971 and 1981.

[23] John D. Durand, The Labour Force in Economic
Development : A Comparison of International Census
Data 1946-66, Princeton University Press, 1975,
pp.78-146.

These bench mark estimates of males and females have been interpolated to obtain the intercensal estimates between 1961-71 and 1971-81. The index number of workers for males and females and for persons have been shown in Table IV.8.

Table IV.8 : Indices of Labour Input in U.P.

Years	Male	Female	Persons
1960-61	100.00	100.00	100.00
1961-62	101.57	96.80	100.95
1962-63	103.16	93.70	101.91
1963-64	104.78	90.70	102.88
1964-65	106.35	87.80	103.85
1965-66	108.02	84.99	104.84
1966-67	109.72	82.27	105.84
1967-68	111.44	79.64	106.84
1968-69	113.19	77.09	107.86
1969-70	114.97	74.62	108.88
1970-71	116.81	72.41	109.97
1971-72	119.01	72.48	111.64
1972-73	121.24	72.55	113.55
1973-74	123.52	72.63	115.49
1974-75	125.84	72.70	117.25
1975-76	128.21	72.77	119.03
1976-77	130.62	72.85	120.84
1977-78	133.08	72.92	122.68
1978-79	135.58	72.99	124.54
1979-80	138.13	73.06	126.43
1980-81	140.72	73.33	130.34

Source : Table IV.7.

There has been an increase of 40.72 per cent in case of male workers during 20 years period. Growth has been faster during 1970-71 to 1980-81 being 20.47 per cent compared to 16.81 per cent growth during 1960-61 to 1970-71.

In case of females, however, there has been a decline of 26.67 per cent during the whole period. There has been a decline of 27.59 per cent during the first decade and marginal increase of 1.27 per cent during the second decade. Growth rates for males and females and total working force together with growth rates of males, female and total population have been shown in Table IV.9.

Table IV.9 :   Growth Rates of Working Force and Population in U.P.

Period	Male		Female		Persons	
	Working force	Popula-tion	Working force	Popula-tion	Working force	Popula-tion
1961-71	1.57	1.98	-3.18	1.64	0.95	1.82
1971-81	1.88	2.25	0.13	2.33	1.71	2.30
1961-81	1.72	2.12	-1.54	1.99	1.33	2.06

Source :   For growth of working force see Table IV.8. For growth of population see Census of India, U.P. 1961, 1971 and 1981.

Taking the working force as a whole (males and females combined) it is seen that during the study period i.e., from 1960-61 to 1980-81 growth in labour input has all along been lower than the growth of male work force in the State. This is because while femeles account for about 46 per cent of the total population in the State, growth of female labour input has been negative during the reference period 1960-61 to 1980-81. Thus, it has pulled down the growth of working force in the State, despite a relatively higher growth (1.72 per cent per annum) observed for male input during the period.

Comparing growth rates of working population for each sex and for combined numbers of males and females with corresponding growth rates of population, it is evident that in each case the growth of labour input has always been very slow compared to the growth of the population. While each has grown overtime, but growth of population has always exceeded the growth in the working force.

It needs to be mentioned here, that the time series of the indices of labour input given in Table IV.8 and in subsequent tables prepared for different

sectors, are all based on geometric interpolation of
the bench mark estimates, and hence assume a constant
geometric rate of growth, during the inter-censal
period. These do not therefore measure correctly,
annual changes in the estimates of the working force,
that may be of substantial order, due to changes in
birth and death rates and emigration and immigration
of workers, from and into the State. For the lack of
requisite data, for building up of such series, it has
not been possible to make any adjustment on this account.

5. Sectoral Growth in Labour Input

Number of workers in the three broad sectors of
the economy viz. primary, secondary and tertiary have
been presented in Table IV.10. Index numbers showing
sector-wise growth in labour input and growth rates
during different periods have been presented in Table
IV.11 and IV.12 respectively.

Table IV.10 : Number of Workers in Different
Sectors

(in '000)

Census Year	Primary			Secondary[24]			Tertiary		
	Male	Fe-male	Per-sons	Male	Fe-male	Per-sons	Male	Fe-male	Per-sons
1961	15387	3306	18693	2155	265	2420	3486	257	3743
1971	18890	2430	21320	2070	141	2211	2602	201	3803
1981	21956	2339	24295	3272	215	3487	4362	251	4613

Sources :   i) For 1961 see the text and Appendix C and C_1.

    ii) For 1971 see Census of India 1971, Series - 21, U.P.

   iii) For 1981 see Census of India 1981, Series - 22, U.P., Primary Census Abstract.

[24] Besides mining, registered and unregistered manufacturing, the secondary sector also includes electricity, gas and water supply. Since 1981 Census has not yet published detailed classification of workers, under different industrial categories, number of workers in the sector electricity, gas and water supply in 1981 have been obtained by assuming same percentage growth between 1971 and 1981 as revealed by ASI data for this sub-sector.

Table IV.11 : Indices of Number of Workers
in Broad Sectors

Years	Primary	Secondary	Tertiary
1960-61	100.00	100.00	100.00
1961-62	101.32	99.10	100.16
1962-63	102.64	98.21	100.32
1963-64	103.97	97.32	100.48
1964-65	105.33	96.45	100.64
1965-66	106.70	95.58	100.80
1966-67	108.08	94.72	100.96
1967-68	109.49	93.87	101.12
1968-69	110.91	93.02	101.28
1969-70	112.35	92.19	101.45
1970-71	114.05	91.36	101.60
1971-72	115.53	95.65	103.53
1972-73	117.05	100.15	105.50
1973-74	118.57	104.86	107.50
1974-75	120.12	109.78	109.54
1975-76	121.68	114.94	111.62
1976-77	123.26	120.35	113.74
1977-78	124.86	126.00	115.91
1978-79	126.48	131.93	118.11
1979-80	128.13	138.13	120.35
1980-81	129.97	144.17	123.24

Source : Table IV.10.

Table IV.12 : Growth Rates of Labour Input
in Broad Sectors

Period	Primary	Secondary	Tertiary
1960-61 to 1980-81	1.32	1.85	1.05
1960-61 to 1970-71	1.32	-0.90	0.16
1970-71 to 1980-81	1.32	4.67	1.95

Source : Table IV.11.

Over the period of twenty years, the secondary
sector stands first in terms of growth of labour input,
primary and the tertiary sectors occupy the second and
the third positions respectively.

The two decades, 1960-61 to 1970-71 and 1970-71
to 1980-81, seem to differ a great deal, with respect
to sectoral growth in the labour input. During 1960-61
to 1970-71 growth was fastest in the primary sector
followed by tertiary and the secondary sectors; secon-
dary sector registering a negative growth of .90 per
cent per annum (Table IV.12). However, during 1970-71
to 1980-81, rate of growth was highest in the secondary
sector followed by tertiary and the primary sectors.

Over the two decades 1960-61 to 1980-81, rate of growth
of labour input, has remained unchanged in the primary
sectors.

Thus there appears to be a moderate shift in the
structure of employment in the economy, especially during
the second decade. Such shift, is of great importance,
and needs to be studied in detail. For this purpose, per-
centage distribution of main workers into the three sec-
tors has been presented in Table IV.13.

Table IV.13 : Percentage Distribution of Working
Force Under Different Sectors

Sectors	1961	1971	1981
Primary	75.25	78.04	75.06
Secondary	9.69	8.05	10.70
Tertiary	15.06	13.91	14.24
Total	100.00	100.00	100.00

Source : Table IV.12.

As in all the underdeveloped agrarian economies,
the primary sector in the State occupies the highest
share in total employment, being more than two-thirds
during the whole period of 20 years. Shares of the
secondary and tertiary sectors are comparatively small;
smallest being that of the secondary sector. It may
further be noticed, that the share of the primary sector
has increased in 1971 as compared to 1961, and declined
in 1981. Census data on employment are known to suffer
from severe limitations of comparability overtime, espe-
cially in case of female workers who are very sensitive
to definitional changes. But it can be inferred even
from the figures of male workers, that the share of
primary sector in total employment has increased during
1951 to 1970-71. Reverse trends can be seen in the secon-
dary and tertiary sectors. This structural shift in the
employment, when viewed together with the shift in the
structure of total output in the State, shows that while
there has been a continuous decline in the share of the
primary sector in total SDP, during 1960-61 to 1970-71,
share of this sector in total employment has increased,[25]

25 See Chapter II of this thesis (Table II

indicating a decline in productivity per worker in this sector. This is because, agriculture, the dominant component of the primary sector, is characterised by family based subsistence farming in the State. "It can thus employ a large part of increments in the supply of labour in the guise of the family labour, independently of the average and marginal productivity considerations. When labour fails to find employment elsewhere it gets absorbed in this sector without its depressive effects on productivity becoming apparent in the short-run".[26] However, during the latter half of the period of our study decline in the output share of the primary sector has been accompanied by the decline in the share of employment as well. Thus, the decade 1971-81 witnessed signs of some structural diversification as evident from the decline in the share of the primary sector and increase in the employment share of the secondary and tertiary sectors.

It also appears worth mentioning that the share of the tertiary sector in total output is larger compared to

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[26] Artreyi Majumdar, Structural Transformation and Economic Development, Birla Institute of Scientific and Economic Research Division, 1979, p.26.

the secondary sector. It shows that the secondary
sector which has to play most crucial role in economic
development has failed to absorb the number of workers
released from the primary sector, and it is the tertiary
sector, usually found to be low productivity sector[27]
that has absorbed some of this surplus labour. A higher
share of tertiary sector than that of the secondary in
a backward economy like U.P. is an evidence of the in-
capability of the industrial sector to absorb the larger
portion of the working force by creating enough job
opportunities.

6. Labour Input : Qualitative Growth

The index of labour input given in Table IV.8
treats all labour as homogeneous. Individual workers
may however differ from each other with respect to
certain innate and acquired characteristics such as sex,
ability, health and education. Not only that people
in the working force at any given point of time differ
from each other with respect of some of these characte-
ristics, the distribution of many of these characteristics

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[27]Anne Booth and R.M. Sundaram, Labour Absorption in
Agriculture, Oxford University Press, 1984, p.5.

in the working force also changes with the passage of time. Most commonly noted change in this respect is the change in the sex-composition of the working force, reflected in changes in the female participation rates overtime.[28]

Due to these inherent and acquired characteristics, contribution of different individuals to the final product also differs markedly. Hence in growth accounting studies attempts have been made to adjust the general index of labour input (as the one given in Table IV.8) for as many qualitative characteristics as are possible of quantification, particularly where noticeable changes are observed to have taken place in the qualities of working force during the period of study.[29] Characteristics

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[28]In developing economies "women frequently choose to persue their traditional roles in the household. The march of modernity is likely to bring about a change in the attitudes of people and cause a difference in this. Overtime sex-composition of the working force may as a consequence change". Hicks, Mukherjee and Ghosh, The Frame Work of the Indian Economy, Oxford University Press, Delhi, 1984, p.84.

[29]E.F. Denison, Accounting for United States Sources of Economic Growth, The Brooking Institution, Washington, 1969, p.30.

choosen for this purpose have generally been changes in
the sex-composition of the working force, changes in the
age-structure of the employed persons, changes in the
educational and nutritional levels of the work force etc.
Due to problems of data availability, quality adjustments
in this study are confined to changes in the educational
levels of the work force and changes in its sex-composi-
tion only.

Rationale for making adjustments for changing educa-
tional levels of the work force stems from the belief
that education renders workers more productive.[30] While
economists have long been aware of the power of education
in enhancing labour productivity by incalculating know-
ledge and skills,[31] the faith in education productivity
link became all the more stronger since the development
of the concept of 'human capital'.[32] Empirical researches

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[30]M. Blaug, Education and the Employment Problem in
Developing Countries, ILO, 1974 (Reprinted in 1980 by
Macmillan Company of India Limited), pp.28-39.

[31]"Adam Smith for example, stressed the importance of
education at various points in the wealth of Nations and the
specifically included "The Acquired and Useful Abilities of
all the inhabitants or members of Society" in his concept of
fixed capital. See Fedrick Harbinson & Charles A. Myers,
Education Manpower and Economic Growth : Strategies of Human
Resource Development, Oxford & IBH Publishing Co., IIIrd
Indian reprint, 1974, p.3.

[32]T.w. Shultz, "Investment in Human Capital", American
Economic Review, Vol.51, No.2, March 1961.

on the subject revealed that increased education of
the work force has been one of the most important
sources responsible for rapid economic growth of many
developed countries in the western world. Denison[33] for
example estimated that during the period 1929 to 1957
increased education of the work force contributed 42
per cent of the measured economic growth of per capita
income in the United States. Although in case of deve-
loping countries education as a source of economic growth
has been found to be relatively less important,[34] still
it seems quite necessary and interesting to assess the
role of this source in case of a backward economic
State like Uttar Pradesh.

Rationale for making adjustment for changing sex-
composition of the work force rests on the proposition
generally found valid that a male worker is more produc-
tive than a female worker. Changes in sex-composition
are taken care of simultaneously with changes in education

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[33] E.F. Denison, Sources of Economic Growth in the
United States and the Alternative before Us, op. cit.,

[34] A.P. Thirlwal, Growth and Development with Special
Reference to Developing Economies, English Language Book
Society, Macmillan IIIrd edition, 1985, pp.76-78.

levels by assigning separate weights to males and
females with a given level of education.

7. Construction of the Quality Index

Construction of quality index of labour that mea-
sures the effect of increased educational levels and
changing sex proportion of the work force, requires
sex-wise break-up of the working force by broad educa-
tional levels and a set of weights to combine workers
with different levels of education. Usual practice in
such studies has been to use sex-wise earning diffe-
rentials associated with different levels of education
for the purpose of weights.

While power of education as a factor in explain-
ing the variance of labour incomes among individuals
in developing countries has been widely noted[35] it can
in no way be denied that a part of these observed in-
come differentials may be caused by other factors - such

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[35]A. Berry, "Education, Income, Productivity, and
Urban Poverty" in Education and Income, Timothy King
(ed.), World Bank Staff Working Paper No.402, July 1980,
pp.168-171.

as ability, parental education, social contacts etc.
Denison[36] makes a deduction of two-fifth from the ob-
served income differentials for these factors. Dholakia[37]
makes an adjustment of one-third for these factors.
However, as these factors may also be changing with the
spread of education in the population, it appears more
reasonable to attribute whole of the observed income
differentials to education instead of making any constant
adjustment for other factors effecting income, on the
assumption that these factors would also be effected by
the spread of education in the population. This appears
to be a plausible assumption unless one has sufficient
data for estimating the true income differentials asso-
ciated with different educational levels, after elimi-
nating the effect of all other variables on income. In
fact "the case for making no adjustment in growth accoun-
ting (in contrast to the rate of return analysis) is
much stronger than is commonly supposed, however. As
education spreads through a society, each generation of
young people comes from a total population of more

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[36] E.F. Denison, Sources of Economic Growth in the
United States and the Alternative Before Us, op. cit,
p.73.

[37] B.H. Dholakia, Sources of Economic Growth in India,
op. cit, p.121.

educated persons than in the prior generations. We
know also that parental education contributes to school
performance. Among the factors raising the quality of
human resources over time are the contributions that
come from the home environment. This means that there
is no deterioration (and some times there is actually
appreciation) in the quality of young people entering
successively higher levels of education in latter as
compared with earlier periods. To make the essentially
static model adjustments for ability (even if these were
not exaggerated adjustments) is then inappropriate for
the measurement of the quality of the labour force.[38]

Use of earning differentials is based on the assum-
ption that the marginal productivities are well reflected
by income differentials. This is turn pre-supposes the
existence of a perfectly competetive labour market so
that the equality between average-wage and the marginal
product of labour is maintained. Though labour market
in the State is characterised by many imperfections, the
assumption may appear fairly valid provided one has

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[38]Mary Jean Bowman, "Education and Economic Growth :
An Overview" in Education and Income, op. cit, p.47.

sufficient confidence in the concept of 'labour market segmentation'.[39] The market can thus be concieved of as divided into different segments according to the levels of education each having its own demand and supply curves. Each market would function independently irrespective of supply and demand conditions in other segments of the market in such a manner "(i) a rise in the average rate of earnings leads to an increase in the supply and decrease in demand though with a time lag and (ii) excess demand causes average earnings to rise".[40] Use of these assumptions in the studies already made in the past, along with supporting evidence from some studies that the classic demand supply relationship holds good in the educated labour market in India although with a time lag,[41] justifies our stand in using earning differentials by levels of education,as an indicator of productivity differentials.

[39]For a review of literature on labour market segmentation see, J.P.B. Godwin, "The Definition and Analysis Local Labour Markets : Some Empirical Problems", British Journal of Industrial Relations, Vol.VIII, No.2, 1970.

[40]B.H. Dholakia, Sources of Economic Growth in India, op. cit, p.111.

[41]M. Blaug, P.R.G. Layard and M. Woodhall, The Causes of Graduate Unemployment in India, Allen Lane, The Penguine Press, London, 1969, p.16.

Having provided ample justification for use of observed earning differentials, we now look for the data for this purpose. As income differentials by levels of education are found to be higher in urban areas than in the rural areas of the developing countries[42], separate weights for both the sectors are desirable. Unfortunately however, there have been no regular surveys in the State to provide information for either sector. Hence information available from individual studies has been relied upon.

In case of the urban sector, weights have been prepared on the basis of income differentials given in the study "Women Workers in the Urban Labour Market: A study of Segregation and Discrimination in the Employment in Lucknow".[43] The study provides income differentials by levels of education for both the sexes. Average earnings of male and female by levels of education as given in the study are reproduced in Table IV.14.

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[42]Albert Berry, "Education, Income Productivity and the Urban Poverty" in <u>Education and Income</u>, op. cit, p.166.

[43]T.S. Papola, <u>Women Workers in an Urban Labour Market : A Study of Segregation and Discrimination in Employment in Lucknow (India)</u>, Sponsored by ILO, Geneva, Giri Institute of Development Studies, Lucknow, 1982.

Table IV.14 :   Average Monthly Emoluments of
                the Establishment Workers by
                Educational Levels

Levels of Education	Monthly Emoluments (in Rs.)	
	Male	Female
1. Illiterate	235.00	248.68
2. Primary	261.98	309.40
3. Secondary	528.71	491.47
4. First Degree	841.83	613.84
5. Higher	1193.94	791.26
All	720.74	597.05

Source : T.S. Papola, Women Workers in an Urban Labour
         Market : Table V : 5, p.102, Giri Institute
         of Development Studies, Lucknow, 1982.

It may be noted from Table IV.14 that while for
both males and females, there is a positive relationship
between earnings and levels of education, income diffe-
rentials by levels of education are found to favour
females in the lower educational levels, and males in
the higher educational ladders.[44]   This highlights the

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[44]T.S. Papola, Women Workers in an Urban Labour
Market, op. cit, p.101.

discriminatory nature of urban labour market which differentiates against women workers in providing job opportunities.[45] Based on Table IV.14 weights for male workers with different levels of education and relative male-female weights for different educational levels are set out in tables IV.15 and IV.16 respectively.

Table IV.15 : Weights for Male Workers by Levels of Education (Treating Illiterate Male as 1)

Levels of Education	Weights for Males
Illiterate	1
Primary	1.115
Secondary	2.250
Higher*	5.650

Source : Table IV.14.

* Category 'Higher' in Table IV.15 and IV.16 corresponds to the average of categories 4th and 5th in Table IV.14.

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[45] For different facets of discrimination faced by female workers in the Indian Labour Market see,

(i) Sqapna Mukhopadhya, "Women Workers of India : A Case of Market Segmentation" in Women in the Indian Labour Force, ARTEP, Bangkok, 1981, pp.93-119.

(ii) T.S. Papola, Sex Discrimination in the Urban Labour Market : Some Propositions based on Indian Evidence, Giri Institute of Development Studies, Lucknow, 1979.

(iii) T.S. Papola, Women Workers in An Urban Labour Market : A Study of Segregation and Discrimination in Employment in Lucknow (India), op. cit.

(iv) Nirmala Banerjee, Women Workers in the Unorganised Sector, Sangam Books (India) Pvt. Ltd., 1985.

Table IV.16 :   Relative Weights for Females
                Treating Male in Each Educa-
                tional Category as 1

Levels of Education	Male	Female
Illiterate	1	1.058
Primary	1	1.181
Secondary	1	.930
Higher	1	.690

Source   :   Table IV.14.

Weights given in Table IV.15 show that counting
work done by an illiterate male worker as 1, we count
the work of a male worker not illiterate but less than
or upto primary level of education as 1.115 units and
so on.

Weights presented in Table IV.16 suggest that with
work of an illiterate male counted as 1, we count the
work of an illiterate female as 1.058 units and so on.

As no comprehensive data are available on income
differentials by levels of education in the rural sector
of the State, weights in case of rural male workers have
been prepared from the information given in the study

"Rural Household Income and its Disposition in Uttar Pradesh".[46] Relative weights for rural females have been prepared using the information on male-female wage differentials available from the reports of Agricultural Labour Enquiry. Weights for rural male workers based on education-wise earnings data and relative male-female weights so prepared are given in Table IV.17 and IV.18.

Table IV.17 : Weights for Male Workers with Different Levels of Education

Levels of Education	Weight
Illiterate	1
Primary	0.99
Above primary	1.52

Source : Methodological Note given in the Appendix C_2.

Table IV.18 : Relative Weights for Males and Females based on Earning Differentials (Rural Sector)

Levels of Education	Male	Female
Illiterate	1	0.774
Primary	1	0.774
Above Primary	1	0.557

Source : Methodological Note given in the Appendix C_2.

[46]Rural Household Income and Its Disposition in Uttar Pradesh, Perspective Planning Division, State Planning Institute, U.P., May 1984.

Having developed two sets of weights for combining workers with different educational levels in the urban and rural areas of the State, we now turn towards the break-up of the working force by levels of education. While Census authorities since 1961 have started providing information in this respect, the classification followed in each Census is not identical. For example while in 1971 Census workers in the educational category 'above matriculation', have been further classified as technical degree and diploma holders, graduates, and above graduates, the information available from 1961-and the 1981[47] Censuses does not strictly correspond to above, the same classification, especially for the educational category 'graduates' and 'above graduates'. In order to maintain homogeniety of classification for each Census, constrained also by the availability of weights, present study considers

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[47] While for 1981 Census data on educational break up of the working force is still awaited, the published data for educational break-up of the population also lumps together both graduates and those having above graduate educational levels.

following broad educational levels in rural and urban areas of the State.[48]

Rural Sector	Urban Sector
1. Illiterate	1. Illiterate
2. Upto primary level	2. Upto primary level
3. Above primary level	3. Upto secondary level
	4. Above secondary or higher educational level

While 1961 Census gave the required break-up of the working force, the data could not be used as such due to the non-comparability in the concept of 'worker' in 1961 and 1971. An exercise to make 1961 work force comparable to 1971 has been made earlier. The percentage distribution of work force by educational levels for our estimated 1961 estimates of the work force has been assumed to be the same as given in the 1961 Census. For 1971, educational decomposition of the work force given in 1971 Census has

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[48] In case of rural sector category (i) includes all those who are illiterate, category (ii) includes all those not illiterate but with less than or upto primary level of education. All those having more than primary education have been included in category (iii) above primary level.

In case of urban sector categories (i) and (ii) have same meaning as in rural sector. In category (iii) all those having education more than primary but less than or upto secondary level, have been included. Those with more than secondary education have been included in the fourth category 'higher' or above secondary level.

been adopted. As data on work force by levels of education have not yet been published in case of 1981 Census, these have been estimated from the information available about the break-up of the population by broad educational levels on the assumption that, percentage distribution of the working force by levels of education would be the same as the percentage distribution of the population by levels of education. Comparable break down of the work force by educational levels at three points of time is given below for rural and urban sectors separately.

Table IV.19 : Workers by Educational Level
(Rural)

(figures in '000)

Educational levels	1961		1971		1981	
	Male	Female	Male	Female	Male	Female
Illiterate	13898	3537	15349	2495	15876	2293
Primary	4317	62	3972	72	5518	196
Above primary	288	2	1986	30	3098	45

Source : See the text.

Table IV.20 : Workers by Educational Level
(Urban)

(in '000)

Educational levels	1961		1971		1981	
	Male	Female	Male	Female	Male	Female
Illiterate	1108	185	1369	113	2308	176
Primary	1061	27	829	16	1278	54
Secondary	264	9	886	29	1200	33
Above secondary	92	6	171	15	312	9

Source : See the text.

Having obtained the numbers of workers with diffe-
rent educational levels and the set of weights based on
education earning differentials, the two sets of infor-
mation have been brought together for the purpose of
constructing quality index of labour. The index has been
prepared following three steps : (i) in the first step
female work in the two sectors rural and urban, has
been converted into male work using relative weights
for males and females given in Tables IV.16 and IV.18
respectively in the corresponding sectors as weight;
(ii) in the second step, work performed by different edu-
cational category of male workers has been combined

separately for rural and urban sectors using relative
weights for different educational categories (of male
workers) from Tables IV.15 and IV.17 respectively; (iii)
resulting estimates of average work performed by illi-
terate male workers in rural and urban sectors are added
separately in the third step, using proportion of rural
and urban workers in the total working force in the State
(Appendix Table C_2.2) as weights.   Bench mark estimates
for the three Census dates - 1961, 1971 and 1981 have
been interpolated to obtain the quality index of labour.
Quality index along with unadjusted labour input index
and labour input index adjusted for quality change
(obtained by multiplying the unadjusted index and quality
index) are shown in Table IV.21.   Compound growth rates
have been presented in Table IV.22.

Column (4) of Table IV.21 provides a measure of
labour input in which labour incurred by all males and
females with differing educational levels has been added
together by converting into the amount of labour performed
by an illiterate worker.   The index does not, however,
measure a host of other influences operating on the average
quality of labour, such as changes in the intensity of
work, associated with changes in the length of hours worked,

Table IV.21 : Adjusted and Unadjusted Indices of Labour Input

Period	Index of labour input unadjusted for quality change	Index of quality change as effected by increased education and changing sex-composition	Index of Labour input adjusted for quality change
1	2	3	4
1960-61	100.00	100.00	100.00
1961-62	100.95	101.45	102.41
1962-63	101.91	102.97	105.51
1963-64	102.88	104.52	107.53
1964-65	103.85	106.08	110.16
1965-66	104.84	107.68	112.89
1966-67	105.84	109.29	115.67
1967-68	106.84	110.93	118.52
1968-69	107.86	112.59	121.44
1969-70	108.88	114.28	124.43
1970-71	109.97	115.51	127.03
1971-72	111.64	116.20	129.73
1972-73	113.55	116.90	132.74
1973-74	115.49	117.60	135.82
1974-75	117.25	118.30	138.71
1975-76	119.03	119.01	141.66
1976-77	120.84	119.73	144.66
1977-78	122.68	120.45	147.78
1978-79	124.59	121.17	150.97
1979-80	126.43	121.90	154.12
1980-81	130.34	122.70	159.93

Source : Column (1) - Table IV.8.

Column (2) - See the text.

Column (3) - Obtained by multiplying Cols.(1) and (2).

Table IV.22 : Compound Growth Rates per Annum
of Labour Input Adjusted for
Quality Change

Period	Labour input unadjusted for quality change	Quality of labour input as effected by increased education and changing sex-composition of the working force	Labour Input adjusted for quality change
1	2	3	4
1960-81	1.33	1.03	2.37
1960-71	.95	1.45	2.42
1970-81	1.71	.61	2.33

Source : Table IV.21.

changes in health and age-composition of the work force

etc. for which no appropriate and reliable data exist

in the State.

The quality adjusted index of labour input shows a

growth of 56.49 *59.93* per cent during twenty years period

from 1960-61 to 1980-81 or an average compound growth

of 2.37 per cent per annum. During the same period

index of unadjusted labour input shows a growth of 30.34

per cent or 1.33 per cent per annum. Thus, 43.88 per

cent of measured growth of adjusted index of labour input turns out to be the contribution of education and sex-compositional changes. Looking decade-wise during 1960-61 to 1970-71 and during 1970-71 to 1980-81 these two factors viz. changes in education and sex-composition appear to have contributed 5̶6̶.̶4̶2̶ 59.92 per cent and 26.16 per cent of the growth in quality index of labour input respectively. It is striking to note that importance of these factors in contributing to the growth of labour input is decreasing with time being more than halved during the decade 1970-71 to 1980-81 as compared to the earlier decade.

8. Conclusion

Main conclusions of the analysis may be summarised as :

1. During 1960-61 to 1980-81 measured as the numbers in the working force, labour input in the State records

a growth of 1.33 per cent per annum. During this period
its two components male and female inputs have grown
at average annual compound rates of 1.72 and -1.54 per
cent respectively.

2.   Both male and female inputs have improved their
rates of growth during 1970-71 to 1980-81 as compared
to 1960-61 to 1970-71. As a consequence labour input
in the economy has grown faster during the latter
decade as compared to the former.

3.   Due to negative rate reported by female input
during 1960-61 to 1980-81, rate of labour input in
the economy has been trailing behind the rate of male
input.

4.   During 1960-61 to 1980-81 labour input in the three
sectors viz. primary, secondary and tertiary has grown at
rates of 1.32, 1.85 and 1.05 per cent annually. A com-
parison of decade-wise performance reveals improvement
in the secondary and tertiary sectors during 1970-71

to 1980-81 in comparison to 1960-61 to 1970-71. Improvement has been much faster in the secondary sector, so much so, that not only it has improved its rates during seventies as compared to sixties but has also experienced rates higher than the rates experienced by other two sectors namely primary and the tertiary.

5.   During 1960-61 to 1980-81, quality of labour input due to the effect of education and changing sex-composition of the work-force has grown at a rate of 1.03 per cent per annum. Growth of quality has been slower during seventies as compared to sixties.

6.   Adjustment for qualitative change raises the rate of growth of labour input from 1.33 per cent per annum to 2.37 per cent per annum during 1960-61 to 1980-81. Despite slowering down of quality change, the quality adjusted input has grown faster during seventies as compared to sixties, indicating that faster growth of labour quantity has more than offset the slowering effect of quality.

Appendix C

Owing to the need of comparable estimates for 1961
and 1971 Census, the Registrar General of Census Opera-
tions had conducted a resurvey in 1972 in rural and urban
areas of 18 States (including union territories). In
this survey, two independent samples were drawn from
each State. In one sample 1961 Census questions were
convassed, and in the other 1971 questions were convassed.
The difference in the sample participation rates was
expected to measure the net effect of conceptual diffe-
rence on the participation rates in each Census*. The
excercise was performed for the three main activities
viz. cultivators, agricultural labourers, and other
workers.

To obtain comparable estimates of workers, the Re-
survey suggested an adjustment factor (to be added or
subtracted) for each of the three main activities which
would make 1961 and 1971 Census estimates free of concep-
tual differences. This factor was to be worked out as

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* Samples being completely independent of each other
and enquires being conducted under similar conditions
and time effect due to temporal change and net effect
of temporal and conceptual difference was assumed to
be negligible. Sampling error for the two samples
were also assumed to be of the same order.

a fixed proportion of the total population, equal to the difference between two sample participation rates.

The use of above method however led to two different rates of change in the participation rates of workers. To avoid this problem CSO has used the ratio method which ensures that the rate of change remains the same irrespective of the concept used. The method consists in multiplying the actual count of workers in 1961 Census by the ratio of actual to adjusted workers in 1971 Census. Comparable estimates of workers for different industrial categories worked out by Central Statistical Organisation are reproduced in Appendix Table   C.1.

In order to obtain the comparable figures of main workers for the State, it has further been assumed here that the effect of conceptual difference in the participation rates, would be of the same order in the State, as for all-India. Thus, 1961 Census estimates of workers in the State, have been multiplied by the ratio of adjusted to actual estimates of 1961 for all-India, to yield the estimates of different categories of main workers comparable to the 1971 Census estimates of main workers. Resulting estimates together with multiplicative factors (ratio of adjusted to actual estimates of workers for all-India) for different categories of workers have been presented in Appendix Table   C.1.

Table C.1 : Showing Derivation of Number of Main Workers in U.P. in 1961 Comparable to the Estimates of Main Workers Given by 1971 Census

(Figs. in '000)

Industrial Categories	Number of workers in 1961 at the concept of 1961 Census (UP)	Number of workers in 1961 at the concept of 1961 Census (all-India)	Number of workers in 1961 at the concept of 1971 Census (all-India)	K= col.3 col.2	Estimated workers in 1961 at the concept of 1971 Census (UP)	Comparable* estimate of main workers in UP
0	1	2	3	4	5	6
1. Agriculture						
1.1 Cultivator	18428	99611	84601	.849	15645	15645
1.2 Agricultural labour	3261	31522	27918	.886	2889	2889
1.3 Other agricultural & allied activities	159	4303	6579	1.529	243	159*
1.4 Mining & quarrying	13	918	849	.925	12	12
2. Manufacturing						
2.1 Registered	801	7981	3667	.459	368	368
2.2 Unregistered manufacturing	1802	12031	12108	1.006	1813	1802*

Contd.../-

0	1	2	3	4	5	6
3. Construction	214	2059	2439	1.1860	254	214*
4. Electricity, gas and water supply	25	258	249	.965	24	24
5. Transport, storage and communication	399	3019	2917	.966	385	385
6. All other activities	3748	26968	24211	.898	3358	3358
TOTAL NUMBER OF WORKERS	28850	188670	165538		24991	24856

Sources : Col.(1) Census of India, U.P., 1961; Col.(2) Census of India, 1961; Col.(3) National Account Statistics, Sources and Methods, C.S.O., Department of Statistics, Ministry of Planning, Government of India, 1980, p.60; and Cols.(4), (5) and (6) derived as described in the text.

* In case of some industrial activities ratio of adjusted to actual workers of 1961 for all-India turned out to be greater than unity. In such cases estimated worker for 1961 are larger than those reported by the 1961 Census itself. As 1961 Census definition of worker was too liberal it is doubtful that still it would have under enumerated workers for those categories. For these categories (marked by * the number of workers as reported in the 1961 Census have been accepted.

** Figures for registered and unregistered manufacturing in cols.(1) and (2) correspond to the categories non-household manufacturing and the household manufacturing in the 1961 and 1971 Censuses.

Appendix C_1

This appendix describes the method of obtaining
sex-wise distribution of main workers in the estimated
population of main workers in 1961. The method used
is as follows :

1. As work participation rates for urban females
given in 1961 Census and in 1971 and 1981 Census (main
workers) are more or less comparable (Table IV.5),
number of urban female workers as reported in the 1961
Census   have been adopted.

2. As work participation rates for urban male
workers in 1961 Census, become quite comparable with
1971 and 1981 participation rates of urban males,
after excluding from 1961 Census estimates of urban
male workers, workers in the age group 60 and above
(Appendix Table C_1.1), the same have been excluded
from total urban male workers in 1961 to obtain the
comparable figures of main male workers in the urban
sector.

3. Total main workers (males and females) in the
rural sector have been obtained by subtracting the
urban workers (males and females) from the estimated
number of main workers in 1961.

4. As work participation rates for rural males in
1961 Census become quite comparable with main rural
workers in 1971 and 1981, after excluding the workers
in the age-group 0-14 from the Census estimates of rural
workers in 1961 (Appendix Table C_1.2), these have
been excluded to obtain the estimates of main rural male
workers in 1961.

5. Having obtained the estimates of urban male,
urban female and rural males in the estimated population
of main workers in 1961, estimates of rural female
workers have been obtained as residual, by subtracting
the estimates of urban male, urban female and rural male
workers from the estimates of main workers in 1961
(Appendix Table C_1. 3).

6. Same excercise has been repeated to obtain sex-
wise distribution of main workers under three sectors viz.
primary and secondary; workers in the tertiary sector
have been obtained as residual (Appendix Table C_1.4).

Table $C_1.1$:   Work Participation Rates
of Urban Males

Census year	WPR	
1961	51.74	(Based on number of rural male workers)
1961	48.24	(Obtained after excluding workers in the age group 60 and above)
1971	47.85)	
1981	47.30)	(For main workers only)

Source :   See the text and Census of India 1961, 1971
and 1981.

Table $C_2.2$:   Work Participation Rates
for Rural Males in U.P.

Census year	WPR*
1961	59.20 (55.39)
1971	52.98
1981	50.99

Source :   See the text and Census of India,
U.P. 1961, 1971, and 1981.

* WPR given in parenthesis is the estimated work
participation rate for rural males after ex-
cluding workers in the age-group 0-14.

Table $C_1.3$: Distribution of Male and Female Workers in the Estimated Population of Main Workers in 1961 Census

(in '000)

Sectors	Male workers	Female workers	Total workers
Rural	18503	3601	22104
Urban	2525	227	2752
Total	21028	3828	24856

Source : See the text.

Table $C_1.4$: Distribution of Male and Female Main Workers in Broad Sectors in 1961 Estimated Population of Main Workers

(in '000)

Sectors	Male workers	Female workers	Total workers
Primary	15399	3306	18705
Secondary	2143	265	2408
Tertiary	3486	257	3743
Total	21028	3828	24856

Source : See the text.

Appendix   C₂

Purpose of this note is to describe briefly the main
assumptions and the procedure of preparing the set of
weights for the rural sector in Uttar Pradesh based on
education-wise earnings data. In preparing such weights
for rural male workers, reliance has been placed on the
data available from the study "Rural Household Income and
Its Disposition in U.P." carried out by State Planning
Institute, U.P. on the basis of NCAER[1] data relating to
the period June 1975 to July 1976. The study provides
percentage distribution of total household income by the
level of education of the chief earner[2] and distribution
of sample households according to the education of the
chief earner. Dividing percentage distribution of the
household income by the percentage distribution of sample
households for each educational category we have been

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[1]National Council of Applied Economic Research.

[2]The earner who contributed maximum share of the
household income was treated as the chief earner though
he may or may not be the head of the household. See
Rural Household Income and Its Disposition in Uttar
Pradesh, Perspective Planning Division, State Planning
Institute, Lucknow, p.90.

able to obtain differentials in household income by levels of education of the chief earners. Main assumption behind this excercise is that differences in household income are caused only by the differences in the levels of education of the chief earners. Percentage distribution of household income and percentage distribution of sample households (both by educational level of chief earners) along with percentage income differential and derived weights are set-out in Appendix Table $C_2.1$.

Table $C_2.1$: Relative Differences in House-hold Income by Levels of Education of the Chief Earners in U.P.

Educational Level of the Chief Earner	Percentage distribution of household income	Percentage distribution of sample households	Difference in household income	Weights
Illiterate	50.37	55.81	.903	1.00
Primary	20.60	23.05	.894	.99
Above primary	29.05	21.14	1.370	1.52

Source : See the text.

Relative weights for males and females in the educational categories (1) illiterate, and (2) primary have been obtained from the male-female wage differentials

given in the report of Agricultural Labour Enquiry[3] 1974-75. Use of male-female wage differentials in agricultural operations for the purpose of relative weights is based on the fact that majority of women workers in the rural sector in the illiterate and primary educational category, are employed in agriculture.

In order to obtain relative weights for males and females in the educational category 'above primary', male-female wage differentials in non-agricultural operations as given in ALE 1974-75 have been used.

Table $C_2.2$: Percentage of Rural and Urban Workers in Total Population

Year	Rural	Urban	Total
1961	87.99	12.01	100.00
1971	86.77	13.23	100.00
1981	82.80	17.20	100.00

Source : Census of India, U.P. 1961, 1971 and 1981.

Chapter V

GROWTH OF CAPITAL INPUT IN UTTAR PRADESH

Measurement of the amount of labour and capital used in the production of real income is a basic information required for an excercise on the sources of growth of an economy. Without reliable estimates of these inputs it is not possible to make any assessment of the contribution made by different sources to the growth of the economy during a given period of time.[1] The desired series of labour input required for this purpose has already been prepared in Chapter IV. The present chapter is concerned with the measurement of growth of capital input in Uttar Pradesh during twenty years period from 1960-61 to 1980-81. A number of problems are involved in the measurement of capital input and preparation of the desired series. The chapter therefore runs into three sections; Section I

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[1] Uma Datta Roy Choudhury, "Industrial Break-down of Capital Stock in India", Journal of Income and Wealth, Indian Association for Research in National Income and Wealth, Vol.1, No.2, April 1977, p.144.

deals with conceptual and empirical problems in the
measurement of the growth of this factor, Section 2
describes the available data base and the method of
preparing capital input series under the broad sectors
viz. primary, secondary and tertiary of the State
economy. Section 3 presents an analysis of the growth
of capital input in the State and summarises main con-
clusions of the analysis. Appendix D gives details of
methodology followed in preparing the series of capital
input and Appendix E deals with measurement of growth
of land input in Uttar Pradesh.

1. Concept of Capital and Problems in Its Measurement

Conceived in the sense of a factor of production
capital here refers to 'real capital'. It thus in-
cludes all the structures and constructions, machinery
and equipments and inventories of finished and semi-
finished goods used up in the production of real-output
during the period. Measurement of the growth of this
real capital, however, involves many conceptual and
empirical problems. Conceptual problems stem from the

very nature of the capital itself. These relate to
the problem of representing by a single magnitude,
the vast set of hetrogeneous objects of differing
vintages constituting the capital stock.[2] As form
and composition of the assets entering into the capi-
tal stock keep on changing with time on account of
technological change, it becomes all the more diffi-
cult to compare the quantity of capital existing at
one point of time, with that at another point of time,[3]
without any reference to a suitable concept of value.
The problem of measurement and comparison of capital
thus lends itself into the problem of valuation of
the capital stock at different points of time during
the period-under consideration.

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[2] It has however been suggested that, "the problem
of combination of hetrogeneous factors may be avoided
through the use of the all pervasive unit of measure-
ment - a dollar", Haney Scott, "Inferior Factors of
Production", Quarterly Journal of Economics, Vol.76,
1962, p.95.

[3] According to Mrs. Joan Robinson, "The only case
in which an exact comparison between physical stocks
of capital is possible is that in which the stocks are
identical item by item and the two differ only in the
number of complete set of items in each", Joan Robinson,
The Accumulation of Capital, English Language Book
Society and Macmillan, Third edition, 1969, p.119.

Valuation of capital goods is different from the valuation of other economic goods.[4] Ideal measurement requires that all assets in the stock be measured at their market prices. However, as capital goods already in existence and use, have a limited market, such a direct evaluation is not in fact feasible.[5]

Theoretically there are two basic approaches for valuation of the capital stock. Capital may either be valued in terms of its cost or it may be measured in reference to its future productivity.[6] In the latter approach increases in the efficiency of capital as a result of technical advance would be embodied in the measure of capital.[7] But, in a world of changing

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[4] "Capital can not be measured in the ordinary way as other economic goods — valuation of income goods is characteristically a market valuation, the value of goods which enter into the capital stock are characteristically imputed values", Cf. J.R. Hicks, "Measurement of Capital in Relation to the Measurement of other Economic Aggregates", The Theory of Capital, F.A. Lutz and D.C. Hague (eds.), Macmillan, London, 1961, p.19.

[5] J.R. Hicks, Ibid, p.19.

[6] Joan Robinson, "Production Function and the Theory of Capital", Capital and Growth, G.C. Harcourt and N.F. Lang (eds.), Penguin Education, 1973, pp.48, earlier published in Collected Economic Papers, Vol.2, Blackwell, 1965, pp.114-131.

[7] C. Kennedy and A.P. Thirlwall, "Technical Progress: A Survey", Economic Journal, March 1972, pp.28-36.

technology where new capital goods are continuously entering into the capital stock and making the old obsolete, there are serious problems in estimating future productivity of a capital asset. Moreover, it has been observed that, the effect of adjusting capital stock series for embodied or endogeneous change is to raise sensitivity of the growth rate to changes in the rate of capital accumulation.[8] In the models of disembodied technical progress,capital is usually measured with reference to its cost so that increases in the quantity of capital are reflected in the residual term, rather than in the measure of capital input.[9] Measuring capital with reference to cost,is to measure it as an embodiment of the labour time expended in past in producing the asset, and this according to Joan Robinson[10] is congenial to the production function point of view,

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[8]A.P. Thirlwall, Growth and Development : With Special Reference to Developing Economies, ELBS/Macmillan, Third edition, 1985, p.70.

[9]C. Kennedy and A.P. Thirlwall, "Technical Progress: A Survey", op. cit., pp.28-36.

[10]Joan Robinson, "Production Function and the Theory of Capital" in G.C. Harcourt and N.F. Lang (eds.), op. cit., p.48.

for it corresponds to the essential nature of capital, regarded as the factor of production.

Measurement of the capital stock in reference to its cost lies in estimating the replacement cost[11] of the asset, with the help of original cost data. But, the original cost of an asset will not be equal to its present replacement cost for reasons of productivity decline and price change. These being solved, capital stock for any year, selected as the base year, measures the amount of resources used in the production of various assets of the stock in that year. Valuation of the capital stock for sucessive years is done by adding gross annual addition and capital consumption measured at base year price, to the base year value of the stock. Thus problems of measurement and comparison of capital stock at different points of time are tackled by cons-tructing an index of real capital stock that measures

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[11]Richard and Naney Ruggles suggests, "In a nor-mally competitive economy, reproduction cost of capital good (in terms of economic functions) would approximate market value, so that we could ask how a given invest-ment in the volume of capital valued at cost of produc-tion would effect annual rate of output", Cf. Richard and Nancy Fuggles, "Concept of Real Capital Stock and Services", Studies in Income and Wealth, Vol.25, Princeton University Press, NBER, 1961, p.398.

the value capital stock existing at those points of time at some base year prices.[12]

Besides being statistically convenient this measure is completely independent of the measurement of other factors that may contribute to output. Various merits of this measure as observed by Denison are "this method it should be emphasised is in no way dependent upon the ability to measure other factors of production whose quantity may or may not infact be measurable. Just as it is possible and interesting to compute changes in output per man hour with no knowledge of the stock of capital or other agents of production, so this method permits a parallel measurement of changes in output per unit and in particular as to whether these changes are related to the quality of other factors considered or to the quantity and quality of other productive resources with which it is combined, or to institutional factors including the growth of knowledge and scale of output."[13]

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[12]Bakul. H. Dholakia, "Measurement of Capital Input and Estimation of Time Series Production Function in Indian Manufacture", The Indian Economic Journal, No.3, Vol.24, January-March 1977, pp.349-368.

[13]E.F. Denison, "Theoretical Aspect of Quality Change, Capital Consumption and Net Capital Formation", Problems of Capital Formation : Concepts Measurement and Controlling Factors, Studies in Income and Wealth, Vol.19, Princeton, NBER, 1957, pp.223-224.

Barring the problems of measurement of capital consumption for which reliable data are largely unavailable, for all other practical reasons the method has been strongly favoured by Denison as would be obvious by the following remarks "If questions concerning proper timing of capital consumption are withheld, this method of measurement appears to be statistically feasible within reasonable limits. It is in fact the only one for which the estimates exist ....."[14]

For measuring the stock of real capital, a choice is to be made between the gross and the net measures. Due to the problems of measuring depreciation and obolescence which introduce a potential source of error in the measurement of capital, gross stock measures have generally been favoured. The available empirical evidence also points towards a more stable relationship between gross stock of capital and output. In case of

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[14]E. F. Denison, "Theoretical Aspects of Quality Change and Net Capital Formation", Studies in Income and Wealth, Vol. 19, 1957, op. cit., p. 225.

United Kingdom Tibor Barna found that efficiency of

plants tended to increase rather than decrease as plant

grew older, and plants were usually scrapped before

their efficiency actually declined.[15] There is still

stronger case for use of gross stock measures in case

of developing economies where capital assets are used

much beyond the normally estimated economic life be-

cause of capital scarcity.[16] Use of either measure

however involves assumptions that may not necessarily

hold true in actual life. While use of net stock mea-

sures assume that productivity of the capital assets

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[15]Tibor Barna,, "On Measuring Capital" in _The Theory of Capital_, F.A. Lutz and D.C. Hague (eds.), Macmillan, London, 1961, pp.75-94.

[16] (i) S.G. Tiwari, "Concepts and Measurement of Capital Formation" in _Savings and Investment in a Developing Economy_, P.C. Malhotra and A.C. Minocha (eds.), Somaiya Publications, Bombay, 1971, pp.57-76.

(ii) Many studies for the Indian manufacturing sector made earlier also find that reported figures of depreciation in sources such as Census of Manufacturing Industries (CMI) and Annual Survey of Industries (ASI) are not satisfactory as they do not measure the actual decline in the productive capacity of the plant. For instance see, S.R. Hashim and M.M. Dadi, _Capital Output Relations in Indian Manufacturing (1946-64)_, M.S. University of Baroda, Baroda, 1973, pp.9-10; and Asit Banerjee, _Capital Intensity and Productivity in the Indian Manufacturing_, Macmillan, Delhi, 1975.

decline as fast as accounting procedures of deprecia-
tion reveal, use of gross stock measure rests on the
extreme assumption of the constant capital services
throughout the life time of the capital asset. The
problem of selecting an appropriate measure of capital
services has been resolved by Denison by constructing
a weighted index of capital input that leans more
heavily towards the gross stock measure.[17] However due
to the extreme scarcity of relevant data for preparing
the capital stock figures, use of either measure for
the purpose of analysis of economic growth becomes a
matter of convenience than that of choice. Data limita-
tions in the State do not permit use of gross stock
measure. Accordingly therefore, net stock measure has
been used for this study.

2. Data base and Method of Preparing Capital Input
   Series in the State

The problems in the measurement of capital dis-
cussed so far were of the conceptual and definitional
nature. In the next step of the construction of capital
input index extending over several years, one is con-
fronted with many statistical and estimational problems,

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[17]E.F. Denison, Why Growth Rates Differ : Post-War
Experience of Nine Western Countries, The Brooking In-
stitution, Washington D.C., 1967, pp. 140-141.

arising out of incomplete reporting of the required
statistics and lack of information on certain relevant
aspects. Thus, before proceeding further it would be
worth while to discuss briefly the usual procedure of
estimation and type of data base available in the pre-
sent case for preparation of capital input series.

As mentioned earlier a satisfactory measure of
capital at any point of time can be obtained by direct
evaluation of all the assets at that point of time,
such direct evaluation for all sectors and at different
points of time is rather impracticable. Thus different
methods of preparing capital stock series are used for
different sectors. Most popular method in this regard
is the perpetual inventory method[18] where bench mark
estimates of capital available for some base year are
moved to other years by adding net capital formation at
constant base year prices. In some cases where bench
mark estimates are not available from any survey report
etc. but a fairly long series of gross capital formation,

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[18] R. Gold Smith, "A Perpetual Inventory of National
Wealth", Studies in Income and Wealth, Vol.14, NBER, New
York, 1951.

base year estimates are obtained by adding the gross

investment (at constant prices) each year and making

allowance for depreciation on the basis of assumed

average life of the asset. In cases, where adequately

long series of capital expenditure is also not available,

base year estimates are prepared by constructing a hypo-

thetical series of capital expenditure at current

prices.[19] The series is deflated by price deflators

especially prepared for the purpose, and constant price

estimates of expenditure are added together after making

some adjustment for depreciation, to derive the estima-

tes of net capital stock. Net stock estimates so deri-

ved, are moved to other years on the basis of perpetual

inventory method. The extreme scarcity of required . .

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[19] M. Mukherjee and N.S.R. Shastry have estimated
value of private land improvements and irrigation work
on the basis of a hypothetical time series of gross
capital formation. This series was derived as the pro-
duct of an index of per household investment in land
improvement and irrigation and an index of total number
of households. Index of per household investment in
private irrigation and land improvement was derived by
combining the index of agricultural output and rural
population with equal weights. This method has also
been adopted by B.H. Dholakia for estimation of value
of private land and Irrigation works. See,

(i) M. Mukherjee and N.S.R. Shastry, "An Estimate
of the Reproducible Tangible Wealth of India, 1949-50",
Review of Income and Wealth, Series VIII, R. Gold Smith
and C. Saunders (eds.), Bowes & Bowes, London, 1959,
pp. 368-387.

(ii) B.H. Dholakia, Sources of Economic Growth in
India, Goods Companion, Baroda, India, 1974, pp. 184-85.

statistics and lack of even basic information in some
sectors forbids the use of any single method of estima-
tion. Thus, like all-India estimates of capital stock
use of different procedures has been made to prepare
the series of capital input for the State.

The basic materials required for preparing the
series of real capital stock are therefore (i) the bench
mark estimates of the value of net stock of capital,
(ii) yearly figures of net capital formation for the
required period under consideration, and (iii) price
indices for various types of capital goods comprising
the stock of capital. While several attempts have been
made to provide the stock of capital at the all-India
basis at different points of time[20] including a continuous

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[20] (i) Uma Datta and Vinod Prakash, "An Estimate of
Reproducible Tangible Wealth in India, 1949-50", Papers
on National Income and Allied Topics, Vol.1, Asia Publi-
shing House, Bombay, 1960.

(ii) M. Mukherjee and N.S.R. Shastry, "An Estimate
of the Reproducible Tangible Wealth in India", Review of
Income and Wealth, op. cit.

(iii) M. Mukherjee, "An Estimate of the Reproducible
Tangible Wealth of India 1961", Economic Affairs, Vol.IX,
No.1, January 1964.

(iv) Reserve Bank of India, "Estimates of Tangible
Wealth in India", RBI Bulletin, Vol.XVIII, No.1, January
1963.

(v) Reserve Bank of India, "Estimates of Tangible
Wealth in India", RBI Bulletin, Vol.XXVI, No.10, Oct. 1972.

(vi) Uma Datta Roy Choudhury, "Industrial Break-
down of Capital Stock in India", Journal of Income and
Wealth, Vol.1, No.2, April 1977.

series of capital stock from 1948-49 to 1968-69[21] no
such comprehensive estimates have/made at the regional

<u>been</u>

basis. Only estimates available for the State are those
of R.H. Dholakia[22] (1985). Estimates relate to only two
points of time 1960-61 and 1970-71 and provide the
capital stock figure on sectoral basis. However Dhola-
kia's estimates can not be regarded as completely in-
dependently derived estimates as for certain items
estimates have been prepared by allocating all-India
estimates for 1960-61 prepared by B.H. Dholakia, among
different States with the help of certain proportions.

Estimates of the value of capital for certain items
in the capital stock for the State are, however, available
from two nation wide surveys, carried out by Reserve Bank
of India namely all-India Rural Debt and Investment
Survey 1961-62, and all-India Debt and Investment Survey
1971-72.[23] A few estimates are also available from various

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[21]B.H. Dholakia, <u>Sources of Economic Growth in India</u>,
op. cit.

[22]R.H. Dholakia, <u>Regional Disparities in Economic
Growth in India</u>, Himalayan Publishing House, 1985.

[23](i) Reserve Bank of India, "All-India Rural Debt
and Investment Survey, 1961-62", Tangible Wealth, Capital
Expenditure and Capital Formation of Rural Households",
<u>RBI Bulletin</u>, June 1965.

(ii) Reserve Bank of India, <u>All-India Debt and In-
vestment Survey, 1971-72.</u>

The two will be hereafter referred as AIRDIS 1961-62 and
AIDIS 1971-72.

rounds of National Sample Survey Reports. Still there
are certain sectors like forestry, fishery, mining sec-
tors and quarrying, construction, trade, hotels and
restaurants, transport communication and other services,
where no bench mark estimates of value of capital stock
are available. Of course, problems are more acute in
the unorganised part under these sectors. Even in the
organised sector information on reliable basis is not
always available for e.g. in case of organised manufac-
turing where information on all relevant aspects is
published in the ASI reports, estimation of the real
stock of capital poses serious problems.

Besides the problems caused by reported figures
for capital values, which are not usable for any pur-
poseful economic analysis without proper price deflation,
and, which create problems in estimating capital stock
even on the aggregative all-India basis, there are pro-
blems which are specific to the estimation of capital
stock on the regional basis based on ASI data. These
result from the practice of ASI, of allocating assets of
the head office to different branch offices. Problems

arise where head office and the branch offices are not situated in the same State. In such cases book value figures reported for the State in ASI, do not strictly follow the concept of capital stock within the boundaries of the State, analogical to the concept of 'income originating' as used for State income estimation.[24]

Regarding estimates of capital formation also, the situation is not very satisfactory in the State. While estimates of both net and gross capital formation for all-India are published annually by the Central Statistical Organization no corresponding estimates for the State are available/any official source.[25] This is because there are special problems in estimating gross fixed capital formation at the State level[26] such as

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[24] R.H. Dholakia and P.M. Patel, "On Estimating, Net Fixed Capital Formation at Constant Prices in Registered Manufacturing Sector at State Level", The Journal of Income and Wealth, Vol.4, No.1, January 1980, pp. 26-31.

[25] However capital formation by the State Government is published annually in the Budget Documents of the State Government.

[26] While at the national level capital formation estimates are prepared using the three approaches namely the commodity flow approach saving investment approach and the expenditure approach, the first two are not very useful for preparing the regional estimates. Non-availability of basic data on export, imports of capital goods across the State boundaries, is the main reason.

those caused by non-availability of any basic data on
exports and imports of capital goods across the State
boundaries as well as the net inflow from and outside
the State. Only approach suitable for estimating
capital formation at the State level is the expenditure
approach.[27] Adoption of this approach also, poses
problems in procuring State-wise expenditure figures
in some cases. In case of multi-State projects which
extend over many States, such as the construction work
undertaken by Railway and Communication Departments etc,
only the overall expenditure figures are available. As
expenditure on constructing railway track etc. depends
not only on the length of the track but also on clima-
tic and topographical conditions of the region, State-
wise allocation of total expenditure figures on the basis
of a single variable like kilometerage of track may not
be very accurate.

Not only there are problems in procuring data needed
for estimation of fixed capital formation at the State-

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[27] For problems of estimating gross fixed capital
formation at the State level the reader is referred to
D.N. Chaturvedi, "Problems of Estimating Gross Fixed
Capital Formation at the State Level in the Journal of
Income and Wealth, Vol.4, No.1, January 1980, pp.23-25.

level such estimation raises some conceptual issues also,
for example, where the investment made by a State falls
within the geographical boundary of the State but the
benefits of the investment are shared by many other
States.   While adjustments are warranted for dividing
the total investment between output sharing States, such
adjustments leave distortions in capital-output ratios
and limit their applicability for deriving capital stock
estimates, especially when capital is to be measured
from functional point of view.[28]

Despite the problems in the measurement of capital
input at the State level, attempts have been made both
individually and institutionally to estimate capital for-
mation in the State.   Estimates of both gross and net
capital formation have been prepared.   Gross capital for-
mation estimates for the period 1960-61 to 1972-73 have
been prepared by R.N. Lal.[29] Gross capital formation by

[28] M.M. Dadi and S.R. Hashim, "Long-Term Trends in
Capital Output Ratios in Indian Economy and Related
Measurement Problems", Journal of Income and Wealth, Vol.4,
No.2, July 1980, p.72.

[29] R.N. Lal, Capital Formation and Its Financing in
India, Allied Publishers and Private Ltd., 1977.

major asset groups with no sectoral break up has been

provided. Another set of capital formation estimates

are those prepared by Perspective Planning Division,

State Planning Institute, Uttar Pradesh.[30] Estimates

of net capital formation have been prepared for the

Fourth and the Fifth Plan Period i.e. from 1969-70 to

1978-79.[31] Sectoral classification has also been given.

However, neither of the two series are adequately long

to cover the entire period of study and nor of them

provides constant price estimates needed for preparing

real capital stock series. Price deflators needed for

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[30]Perspective Planning Division, State Planning
Institute Lucknow, Uttar Pradesh.

   i. Investment in Uttar Pradesh during Fourth Plan
  ii. Capital Formation in Uttar Pradesh during Fifth
     Plan
 iii. Capital Formation in the Economy of Uttar
     Pradesh : A Study of Development Head-wise
     Estimates, 1969-70 to 1978-79.

     The (iii) will hereafter be referred as SPI
     estimates.

[31]Uttar Pradesh Development and Systems Corporation
(UPDESCO) has also undertaken some excercise at prepa-
ring capital formation estimates during the Sixth Plan
period. However, the estimates have not been published
as yet.

converting current price estimates into constant prices
are also not available for the State and one has to
depend on all-India price deflators available for this
purpose.[32]

Methodology of preparing capital stock series for
the State adopted for the present study has been highly
constrained by the nature and availability of data dis-
cussed in the preceeding paragraphs. As the study
follows broad sectoral classification viz. primary,
secondary and tertiary, separate real stock series (at
1970-71 prices) for all the three sectors are required.
Aggregation of the three series would provide the
capital input series for the State. A systematic pro-
cedure of preparing real stock series for the three
sectors mentioned above requires bench mark estimates
of the net capital stock and continuous time series of
net capital formation or of gross capital formation with
related rates of depreciation each year. However, as

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[32]While some price indices are now prepared for
the State also like the index number of prices of machi-
nery and transport equipment, these are available from
1970-71 and onwards only. As the study period in this
study extends from 1960-61 to 1980-81; use of all-India
indices has been made.

mentioned earlier, comprehensive attempts for preparing independently the bench mark estimates of value of the capital stock on aggregative and sectoral basis are still awaited in the State. Only estimates available are those of R.H. Dholakia.[33] While Dholakia provides capital stock estimates for broad sectors also, the estimates could not be used for preparing capital input series for the State. Though it should have been possible to extend the capital stock estimates prepared by Dholakia for the year 1970-71 to other years with the help of net capital formation series prepared by SPI,[*] this required first, converting the 1970-71 estimates of capital stock at 1970-71 prices for all sectors. Again, net capital formation estimates by State Planning Institute need to be converted at 1970-71 prices. As neither Dholakia nor SPI study provides any idea about the composition of the assets in the capital stock, like structures, machinery and equipments and inventories no appropriate composite price index taking account of variations in the prices of different capital goods in the stock is easily conceivable. Still there would have

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[33]R.H. Dholakia, op. cit., 1985.

[*] See State Planning Institute, Lucknow.

[**] Dholakias estimates are at 1960-61 prices.

remained the problem of estimating net capital formation for the period 1960-61 to 1968-69, at 1970-71 prices.

Use of Lal's[34] series of gross capital formation for extending the bench mark estimates prepared by Dholakia also does not serve the purpose, for capital formation according to broad sectors has not been attempted in the study. Nor is his series sufficiently long to cover the study period adopted for the present study.

With all these limitations in view, neither Dholakia's bench mark estimates, nor the gross and net capital formation series prepared by SPI and R.N. Lal have been used. Series of real capital stock for different sectors have been prepared following different methods for different sectors. Methodology adopted for sectoral estimates is discussed below.

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[34] R.N. Lal, op. cit., 1977.

Primary Sector

Estimation of capital stock series for different sub-sectors in the primary sector has been undertaken separately.

An attempt to measure state-wise growth in capital stock in the agricultural sector during 1961-77 has been made by A.K. Das Gupta.[35] However his measure seems to have left out two important items in the stock viz. stocks in the form of private *Irrigation* and public irrigation works. His study also seems to have omitted the urban farm houses. Besides all this, his study does not provide money value of the stock for the bench mark years. As such, his estimates are not of much help to us, and we have undertaken an independent excercise to measure the growth of capital stock in agriculture by preparing separate estimates for various assets in the stock.

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[35]A.K. Das Gupta, Growth and Composition of Agricultural Capital Stock in Indian State, 1961-77, Hindustan Publishing Corporation (India), 1984.

Capital stock in agriculture consists of following major asset groups (i) farm houses, (ii) machinery and equipments, (iii) livestock, (iv) private irrigation works, (v) public irrigation works, and (vi) inventories. Six capital input series in respect of these asset groups have been prepared using the information available from different sources as given below.

(i) <u>Farm Houses</u> : In case of farm houses bench mark estimates of house property available from all-India Rural Debt and Investment Survey 1961-62 and all-India Debt and Investment Survey 1971-72 have been used. These refer to the market value of rural house property in the State as on 30th June 1961 and 30th June 1971 respectively. Following the conventions set by Uma Datta and Vinod Prakash,[36] Mukherjee and Shastry[37] and RBI,[38] one third of this value after making a 5 per cent discount

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[36] Uma Datta and Vinod Prakash, op. cit.

[37] M. Mukherjee and N.S.R. Shastry in Review of Income and Wealth, op. cit.

[38] Reserve Bank of India, "Estimates of Tangible Wealth in India, <u>RBI Bulletin</u>, Vol.XVIII, No.1, January 1963.

for the value of land has been taken to constitute the value of farm houses in the rural sector. Estimates for the urban sector have been obtained by observing the proportions of rural and urban workers in the total agricultural workers of the State. Estimates for rural and urban sectors in 1960-61 and 1970-71 have been interpolated to obtain the estimates for the intervening years. Index numbers of cost of construction in rural and urban areas have been used for converting current price estimates at constant prices. The values of farm houses after 1970-71 have been obtained by moving rural and urban values in 1970-71 by the index number of residential dwellings in rural and urban sectors respectively, prepared with the help of information on Census houses given in 1971 and 1981 Census. Changes in the quality of Farm houses are assumed to be reflected in the residual term rather than in the capital input itself.

(ii) <u>Machinery and Equipments</u> : In case of machinery and equipments also, basic information has been obtained from the Survey Reports. Bench Mark estimates of the

value of agricultural machinery and equipments availa-
ble from AIRDIS (1961-62) and AIRDIS (1971-72), have
been interpolated to obtain the estimates for inter-
vening years. Estimates for the urban sector have been
obtained as in case of farm houses. Index number of
machinery and transport equipment has been used to
convert the current price estimates into constant
1970-71 prices. Since no bench mark estimate of the
value of agricultural machinery for 1980-81 could be
available, estimate for 1970-71 has been moved to other
years upto 1980-81, with the help of physical index
of agriculture machinery and transport equipment or
'agricultural machinery equivalent' especially develo-
ped for this purpose.

(iii) <u>Livestock</u> : Capital stock in the form of live-
stock has been estimated using the information on number
of animals given in different Livestock Censuses in the
State. Bench mark estimates have been interpolated to
obtain estimates of the number of animals of different
categories for the inter-censal years. Prices of
different categories of animals in 1970-71, as obtained

from State Planning Institute, U.P., have been used as weights
to evaluate the value of total livestock for each year
during 1960-61 to 1980-81.

(iv) <u>Private Irrigation Works</u> : In order to evaluate
value of the capital stock in the form of private ir-
rigation works in the State, information given in the
special survey on capital formation[39] conducted by Eco-
nomic and Statistics Division, State Planning Institute
for the year 1969-70 has been used. Value of urban
private irrigation works in 1969-70 has been obtained
in the same way as value of urban farm houses. Value
figures for 1969-70 have been brought at 1970-71 prices
by the index of cost of construction in the rural sec-
tor. The rural and urban estimates have been combined
and moved to other years on the basis of index of net
area irrigated by private irrigation works in the State.

(v) <u>Public Irrigation Works</u> : Series of capital stock
in the form of public irrigation works in the State,

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[39]<u>Capital Formation in the Rural Sector of Uttar
Pradesh 1969-70</u>, (in Hindi), Economic and Statistics
Division, State Planning Institute, Uttar Pradesh.

has been obtained by accumulating capital expenditure
figures each year, with the help of a fairly long series
of capital accumulation available from the State Irri-
gation Department. Assuming an average life of 50 years,
depreciation at the rate of 2 per cent has been charged
for each year. Accumulated expenditure for 1938-39
after making due allowance for depreciation is assumed
to constitute the value of capital stock in 1938-39.[40]
Value of stock in 1938-39 has been deflated by the index
of cost of construction. _to bring it at 1970-71 prices._ Net investments in public ir-
rigation works each year during 1938-39 to 1959-60 (at.
constant 1970-71 prices)have been added to the 1938-39

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[40]Same procedure has been adopted by Tara Shukla
for evaluating stock of capital during 1920-21 to 1960-
61. She argues "The decade from 1938-39 to 1948-49
witnessed almost a four-fold increase in the general
price level, whereas the preceding decade of 1930 to
1939 showed very little change in prices in spite of
the depression years..... Also in the two decades
before 1930, the general price level rose for the first
half and fell in the second half, leaving the final
value of the index unchanged. This too gives the
ground for assuming that the book value of the assets
in 1938-39 would not be very much different from their
current market value". Cf. Tara Shukla, Capital Forma-
tion in Indian Agriculture, Vora & Company Pvt. Ltd.,
Bombay, 1965, p.133.

value, to obtain the value of stock in 1960-61. Stock value figures for 1960-61 are moved to other years with the help of net investment series in public irrigation works at constant 1970-71 prices.

(vi) <u>Inventories</u> : Adopting RBI practice[41] inventory holding of crops in the agricultural sector is assumed to constitute 10 per cent of the value added.

Time series of capital stock in agriculture according to the asset groups discussed above, have been presented in the Appendix Table D.4.

In case of other subsectors viz. mining, forestry and fisheries, no bench mark estimates of the value of capital stock in the State could be available. Lack of capital expenditure figures in these sub-sectors especially in the unorganised part, on a reliable basis, and for sufficiently long period of time, makes it difficult to follow any systematic procedure, for estimating the stock of capital under these sub-sectors.

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[41]Reserve Bank of India, "Estimates of Saving and Investment in the Indian Economy : 1950-51 to 1962-63", <u>RBI Bulletin</u>, March 1965.

Hence capital stock series for these two sub-sectors have been prepared using all-India capital output ratios (Appendix Table D.6).

Capital input series for above sub sectors have been added up for obtaining capital input series in the primary sector, presented in Table V.1.

Table V.1 : Capital Input in the Primary Sector(at 1970-71 Prices)

(in crore Rs.)

Period	Agriculture	Forestry	Fishing	Total capital input in the primary sector
1960-61	2646.83	10.83	3.21	2660.87
1961-62	2726.12	12.27	3.49	2741.88
1962-63	2755.92	13.90	3.79	2773.61
1963-64	2852.66	15.75	4.12	2872.53
1964-65	2986.15	17.84	4.48	3008.47
1965-66	3065.70	20.21	4.87	3090.78
1966-67	3100.65	22.90	5.29	3128.74
1967-68	3236.35	25.95	5.75	3268.05
1968-69	3342.18	29.40	6.25	3377.83
1969-70	3464.63	33.31	6.79	3504.73
1970-71	3591.07	37.85	7.40	3636.29
1971-72	3671.81	38.76	8.04	3718.61
1972-73	3778.64	39.69	8.74	3827.07
1973-74	3897.54	40.64	9.50	3947.68
1974-75	4049.51	41.62	10.33	4101.46
1975-76	4196.68	42.62	11.23	4383.93
1976-77	4338.90	43.64	12.21	4394.75
1977-78	4481.67	44.69	13.27	4539.63
1978-79	4660.04	45.76	14.42	4720.22
1979-80	4659.55	46.86	15.67	4722.08
1980-81	4830.11	47.98	16.89	4894.98

Secondary Sector

As in the primary sector, separate capital stock series for all the sub-sectors under the secondary sector have been prepared. Except for the mining and construction sectors, where no bench mark estimate of the value of capital stock could be available, for all other sub-sectors, capital stock series has been prepared with the help of State data.

Registered Manufacturing, Electricity, Gas and Water Supply

The two sub-sectors, registered manufacturing and electricity, gas and water supply are organised sectors. Estimation of capital input series in these sectors has been undertaken on the basis of information provided in ASI[41] reports. Even in these sectors which are completely organised and are supposed to be well placed from

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[41] For estimating the stock of capital in registered manufacturing sector, information available from ASI Census sector and sample sector reports, has been pooled. The combined sample and Census report for the State are available from 1967 only.

the point of view of reliability and regularity of the
statistics, many difficulties discussed widely in growth
measuring studies in the manufacturing sector[42] were en-
countered.

Major problem with ASI data is that the figures of
capital stock as reported in ASI are not well in confor-
mity with the concept of capital measurement desired for
the study. ASI, for example, reports depreciated book
values of the capital assets. The book value of capital
in any particular year, represents accumulation of annual
additions to the stock of capital in the past, valued at
their historical prices, net of depreciation charges.
In order to obtain some consistent value of capital in
any particular year, all the past additions to the capital

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[42](i) B.H. Dholakia, "Measurement of Capital Input
and Estimation of Time Series Production Function in
Indian Manufacture", op. cit., p.333.

(ii) Asit Banerjee, Capital Intensity and Produc-
tivity in the Indian Industry", Macmillan India Ltd.,
1975.

(iii) S.R. Hashim and M.M. Dadi, Capital Output
Relations in Indian Manufacturing (1946-64), MS Univer-
sity of Baroda, 1973.

(iv) B.N. Goldar, Productivity Growth in Indian
Industry, Allied Publishers Pvt. Ltd., 1986.

stock must be converted to that year's prices. This
adjustment in prices requires age structure of capital
stock each year.[43] As information on this aspect is
not available from ASI, estimation of fixed capital
stock series becomes rather difficult.

Fixed capital stock series for the registered
manufacturing sector in the State has been prepared,
using the perpetual inventory method which consists
of, first, deriving the value of fixed capital stock
at some base year prices, and then adding to it net
investment in fixed capital each year at base year
prices.

In order to obtain value of the fixed capital
stock in 1960-61 at 1960-61 prices, it has been ob-
served that book value of fixed capital reported in
ASI for 1960-61 is not very large, being Rs.78.29
crores only. Keeping in mind the industrial backwardness

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[43]S.R. Hashim and M.M. Dadi, <u>Capital Output
Relations in Indian Manufacturing (1946-64)</u>, op. cit.,
p. 19.

of the State,[44] it can generally be presumed that much

of this capital must have been formed during the First

and Second Plan periods. This being true, reported

figure in 1960-61 would not represent capital stock

older than 10 years. From the Census of Manufacturing

Industries,[45] book value of fixed capital in 1955

has been obtained. As no marked variations in the

price index were noticed during 1949-50 to 1954-55, it

can be safely concluded, that book values in 1954-55

would not be very much different from their current

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[44]The industrial backwardness of the State is evi-
dent from the fact large and small scale industries
including the unregistered manufacturing units contri-
buted only 10 per cent of the State income during the
year 1970-71, while for the national economy the corres-
ponding share was 15.9 per cent in 1969-70. Of the 10
per cent contribution of the manufacturing sector in
1970-71, 61 per cent was due to the unregistered sector,
the percentage for the country being 39 in 1969-70. See
Five Year Plan : Draft Annual Plan 1978-79, Planning
Department, U.P., 1977, p.66.

[45]Census of Indian Manufactures, Government of
India, Directorate of Industrial Statistics, Delhi
Annual Publication, 1955.

values.   The book value figure for 1954-55 has been
converted at 1960-61 prices.[46] Annual additions to the
capital stock during 1954-55 to 1960-61, (at 1960-61
prices) are added to this stock value to yield estimate
of fixed capital in 1960-61.

Having obtained the bench mark estimate of the
fixed capital stock in 1960-61, the net investment
series (obtained by subtracting from the current year's
figure, the previous year figure) deflated properly to
bring it at 1960-61 prices, has been used to obtain
the stock of fixed capital for the subsequent years.
"Obviously, application of price correction to such
a series is likely to have more meaning because each
yearly addition to the capital stock is likely to
show greater homogeneity as compared to the total book
value in terms of quality, vintage and prices."[47]

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[46]The price index of manufacturing goods used for
this purpose has been the one used by Hashim and Dadi.
See, S.R. Hashim and M.M. Dadi, Capital Output Relations
in Indian Manufacturing (1946-64), op. cit., p.24.

[47]A. Banerjee, Capital Intensity and Productivity
in the Indian Manufacturing, op. cit., p.21.

Series of fixed capital stock at 1960-61 prices has been converted at 1970-71 prices by shifting the base of the index number of machinery and transport equipment to 1970-71 = 100 (Appendix Table D.5).

Working capital values obtained from ASI have been deflated by the index of whole-sale prices to convert them at 1970-71 prices. Working capital and fixed capital series are combined together to obtain the time series of stock of capital input in the registered manufacturing sector of the State.[48]

Similar procedure has been used to obtain the capital input series in the sector 'power, gas and water supply'.

Unregistered Manufacturing

Owing to the scattered nature of economic activity in this sector, both in rural and urban areas, coupled with pre-dominance of enterprises run on the household

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[48]Since working capital in ASI included cash in hand also it has not been possible to exclude it from the capital input series.

basis, regular statistics needed for preparing capital
stock series are not available. Capital input series
in this sector, has been prepared with the help of
rather scanty information available for this purpose.

From 29th round of the National Sample Survey[49],
we obtain the value of owned assets per household in
the unregistered manufacturing sector of the State in
1974-75. Total value of owned assets and gross value
added in this sector have been deflated by the index
number of machinery and transport equipment and general
index of industrial whole-sale prices respectively.
These have been adjusted for depreciation at a rate
of 10 per cent per year, and have been used to work out
capital output ratio for this sector in 1974-75. This
ratio has been moved to other years on the basis of
index of average capital output ratios for the regis-
tered manufacturing sector in the State. The resulting
capital output ratios have been used to work out series
of capital input in the unregistered manufacturing
sector of the State (Appendix Table D.7).

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[49] Report No. 280/3, Tables with Notes on Survey of
Self-employed Households in Non-agricultural Enterprises-
Detailed Results, 29th Round July 1974-June 1975, National
Sample Survey Organization, Ministry of Planning, Govt. of
India, 1978.

The above excercise is based on the assumption that capital output ratios in the unregistered manufacturing sector would move in the same direction and almost at the same rate as the capital output ratios in the registered manufacturing sector of the State.

Construction

As mentioned earlier value of capital stock in this sector could not be available. Hence all-India capital output ratios (see Appendix Table D.6) have been used to work out the capital input series in this sector.

Capital input series for the secondary sector has been obtained by aggregating the capital input series in all the sub-sectors falling under it. Estimates are presented in Table V.2.

Table V.2 : Capital Input in the
Secondary Sector at 1970-71 prices.

(Rs. In crore)

Period	Mining & Quarrying	Un-registered manufacturing	Registered manufacturing	Power, gas & water supply	Construction	Total
1960-61	5.19	46.72	290.98	74.38	165.62	582.89
1961-62	6.06	50.13	300.20	90.34	175.04	621.77
1962-63	7.07	52.58	307.61	93.32	185.00	645.58
1963-64	8.25	61.11	352.03	298.61	195.53	915.53
1964-65	9.63	64.51	382.95	393.45	206.65	1057.19
1965-66	11.24	63.08	421.18	509.25	218.41	1223.16
1966-67	13.12	75.86	445.31	550.31	230.84	1315.44
1967-68	15.31	80.07	463.57	608.26	243.97	1411.18
1968-69	17.86	82.82	535.86	698.97	257.85	1593.36
1969-70	20.85	90.79	631.70	757.54	272.52	1773.40
1970-71	24.37	92.48	732.35	667.85	287.91	2004.96
1971-72	27.93	89.52	793.52	935.97	303.95	2150.89
1972-73	32.01	116.15	796.78	1004.84	320.88	2270.66
1973-74	36.68	109.60	809.66	1067.00	338.75	2361.69
1974-75	42.03	117.61	840.79	1143.85	357.62	2501.90
1975-76	48.17	105.02	841.86	1261.85	377.54	2634.44
1976-77	55.20	109.29	897.19	1361.39	398.57	2821.64
1977-78	63.26	137.69	970.55	1422.39	420.77	3014.66
1978-79	72.50	149.43	1043.51	1545.12	449.20	3254.76
1979-80	83.08	142.98	1066.70	1623.25	468.94	3384.95
1980-81	95.55	166.14	1063.82	1726.59	495.17	3547.27

Source : As per methodology discussed in the text.

Tertiary Sector

As no bench mark estimates of the value of capital stock for different sub-sectors in the tertiary sector like transport, storage and communication, trade, hotels and restaurants etc. could be available, all India capital output ratios (Appendix Table D.6) for these sub-sectors have been used to obtain capital stock estimate for this sector in the State.

In preparing capital stock of this sector we have however, excluded stock in the sub-sectors – 'public administration' and 'real estate and ownership of dwellings'. Capital stock in the form of public buildings, roads, bridges etc. falling under the head 'public administration' has been omitted to maintain consistency between the State income series and the capital stock series. This is because, although the State income series includes income from non-residential structures and constructions, machinery and equipments etc. of the government departmental enterprises, it does not include income accruing to general government capital. The sector 'real estate and ownership of dwellings' has been excluded, because, not only do the estimation of capital

stock in house property is difficult due to problems
of varying vintages, cost changes and market valuation
etc, but also, output of this sector includes some
notional elementsas well. **And** any functional relation-
ship between the estimated stock of capital and the
notional output becomes rather meaningless, when produ-
ctivity and efficiency aspects are important.[50] Total
capital stock in the tertiary sector excluding public
administration and real estate and ownership of dwellings
has been presented in Table V.3.

Series of capital input prepared so far in Table
V.1, V.2 and V.3 have been aggregated to obtain the
broad sectoral estimates of capital input. Resulting
series together with total capital input series in the
State (obtained by adding the three sectoral estimates) **has
been** set out in Table V.4.

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[50] "our proposition is that for purpose of produc-
tion function of the economy and such other excercises
which have implications for efficiency and productivity,
house property should not be counted as part of the
capital stock. It introduces big element of notional
estimates. For such purposes house property should be
considered at par with other consumer durables", M.M. Dadi
& S.R. Hashim, "Long Term Trends in Capital Output Ratios
in the Indian Economy and Related Measurement Problems"
in the Journal of Income and wealth, Vol.4, No.2, July
1980, p.72.

Table V.3 : Capital Input in the Tertiary Sector (at 1970-71 prices)

(Rs in crore)

Period	Transport, storage & communication	Trade, hotels & restaurants	Banking & insurance	Other services excluding public administration	Total
1960-61	1218.66	808.85	25.45	203.78	1150.74
1961-62	1284.97	799.64	26.47	216.21	2237.29
1962-63	1355.29	796.44	27.53	229.40	2408.66
1963-64	1429.68	793.25	28.63	243.39	2494.95
1964-65	1508.59	790.08	29.77	258.24	2586.68
1965-66	1592.24	786.92	30.96	273.99	2684.11
1966-67	1680.92	783.77	32.20	290.71	2787.60
1967-68	1774.95	780.63	33.49	308.44	2897.51
1968-69	1874.70	777.57	34.83	327.25	3014.35
1969-70	1980.48	774.40	36.22	347.21	3138.31
1970-71	2090.43	771.36	38.70	366.84	3267.33
1971-72	2154.29	809.93	40.64	379.36	3384.22
1972-73	2220.63	850.42	42.66	392.26	3505.97
1973-74	2288.37	892.95	44.80	405.60	3631.72
1974-75	2358.72	937.59	47.04	419.39	3762.74
1975-76	2431.40	984.47	49.39	433.65	3898.91
1976-77	2508.32	1033.70	51.86	448.39	4042.46
1977-78	2587.99	1085.38	54.45	463.64	4191.46
1978-79	2668.37	1139.65	57.18	479.40	4344.60
1979-80	2751.44	1196.63	60.04	495.70	4503.81
1980-81	2799.48	1296.44	64.27	513.18	4673.37

Source : As per methodology discussed in the text.

Table V.4 : Capital input in U.P. at (1970-71 Prices)

(Rs. In Crores)

Period	Primary sector	Secondary sector	Tertiary sector	All sectors
1960-61	2660.87	582.89	2250.74	5494.50
1961-62	2741.88	621.77	2327.29	5690.94
1962-63	2773.61	645.58	2408.66	5827.85
1963-64	2872.53	915.53	2494.95	6283.01
1964-65	3008.47	1057.19	2586.68	6652.34
1965-66	3090.78	1223.16	2684.11	6998.05
1966-67	3128.74	1315.44	2787.60	7231.78
1967-68	3268.05	1411.18	2897.51	7576.74
1968-69	3377.83	1593.36	3014.35	7985.54
1969-70	3504.73	1773.40	3138.31	8416.44
1970-71	3636.29	2004.96	3267.33	8908.58
1971-72	3718.61	2150.89	3384.22	9253.72
1972-73	3827.07	2270.66	3505.97	9603.70
1973-74	3947.68	2361.69	3631.72	9941.09
1974-75	4101.46	2501.90	3762.74	10366.10
1975-76	4383.93	2634.44	3898.91	10917.28
1976-77	4394.75	2821.64	4042.27	11258.66
1977-78	4539.63	3014.66	4191.46	11745.75
1978-79	4720.22	3254.76	4344.60	12319.58
1979-80	4722.08	3384.95	4503.81	12610.84
1980-81	4894.98	3547.27	4673.37	13115.62

Source : Tables V.1, V.2 and V.3.

The time series of capital input prepared here takes no account of the intensity of capital use. If same machine is used more intensively in one period than in the other or machine with improved quality but same cost are put to use, they are not expected to effect the capital input measure. Such changes are assumed to be reflected in the measure of total factor productivity input or the residual. No adjustment for capacity utilization has been made for the lack of data.

3. Trends in the Growth of Capital Input

3.1 As mentioned earlier this section attempts to analyse the measured growth of capital input and trends in its rate of growth during the study period. For this purpose indices of real capital input in the State as well as sectoral indices have been presented in Table V.5.

Column 5 of Table V.5 reveals that total capital input in the State has grown more than two-fold during twenty years period i.e., from 1960-61 to 1980-81. However, it has grown more fast during the first half of the period i.e., from 1960-61 to 1970-71 showing a

Table V.5 : Indices of Real Capital Input
in Broad Sectors

Period	Primary sector	Secondary sector	Tertiary sector	All sectors
1	2	3	4	5
1960-61	100.00	100.00	100.00	100.00
1961-62	103.04	106.67	103.40	103.58
1962-63	104.24	110.76	107.02	106.07
1963-64	107.95	157.07	110.85	114.35
1964-65	113.06	181.37	114.93	121.07
1965-66	116.16	209.84	119.25	127.36
1966-67	117.58	225.68	123.85	131.62
1967-68	122.82	242.10	128.74	137.90
1968-69	126.94	273.36	133.93	145.34
1969-70	131.76	304.24	139.43	153.18
1970-71	136.66	343.97	145.17	162.14
1971-72	139.75	369.00	150.36	168.42
1972-73	143.83	389.55	155.77	174.79
1973-74	148.36	405.17	161.36	180.93
1974-75	154.14	429.22	167.18	188.66
1975-76	164.76	451.96	173.23	198.69
1976-77	165.16	484.08	179.60	204.91
1977-78	170.61	517.19	186.23	213.77
1978-79	177.39	558.38	193.03	224.26
1979-80	177.46	580.72	200.10	229.52
1980-81	183.90	608.57	207.64	238.70

Source :   Table V.4.

growth of 62.14 per cent compared to 47.22 per cent growth during the later half of the period.

Looking sector-wise, it is found that highest growth in capital input has occured in the secondary sector. It increased more than six times during the two decades. Noticeable fact however, is that while during the first decade capital input in this sector increased by 243.97 per cent, during the latter decade it increased by 176.93 per cent only.

Tertiary and the primary sectors rank second and third respectively in terms of growth of capital input. Here also, capital input (in both the sectors) grew more in former decade, compared to the latter decade.

Growth rates of capital input in the State along with sectoral growth rates have been presented in Table V.6.

Table V.6 : Growth Rates of Capital Input in UP

(Compound growth rates in per cent per annum)

Periods	Primary sector	Secondary sector	Tertiary sector	All Sectors
1960-61 to 1970-71	3.17	13.15	3.80	4.95
1970-71 to 1980-81	3.01	5.87	3.64	3.94
1960-61 to 1980-81	3.09	9.45	3.72	4.45

Source : Table V.5.

Column 4 of Table V.6 shows that total capital input in the State economy during the twenty years period i.e., from 1960-61 to 1980-81 grew at a compound rate of 4.45 per cent per annum. It has, however, grown more rapidly during the first decade compared to the latter decade. Growth rate during 1970-71 to 1980-81 comes around 3.94 per cent which is 1.01 percentage points lower compared than to the growth rate experienced during the period 1960-61 to 1970-71. Similar trends are observed in sectoral growth rates also.

While total capital input in the State is the aggregation of sectoral capital inputs, the power of any sectoral growth rate to alter the over-all growth rate of capital input in the economy depends on that particular sectoral growth rate and share of that sector in total capital input.[50] Sectoral growth rates have already been presented in Table V.6, sectoral shares in total capital input have been presented in Table V.7.

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[50] Overall growth rate in the economy may be looked upon as the weighted sum of the sectoral growth rates, weights being shares of the sectors in total capital input.

Table V.7 : Percentage Share of Different
Sectors in Total Capital Input
in the State

period	Primary sector	Secondary sector	Tertiary sector	All sectors
1960-61 to 1970-71	44.20	6.97	48.83	100.00
1970-71 to 1980-81	38.92	25.14	35.94	100.00
1960-61 to 1980-81	41.08	17.70	41.22	100.00

Source : Table V.5.

Table V.7 shows over the study period of twenty years. Secondary sector accounts for the smallests share in total capital input in the State. Shares of the primary and tertiary sectors turned out to be almost equal and much larger than that of the secondary sector. Looking period-wise, it is seen that during first decade i.e., 1960-61 to 1970-71 tertiary sector had the maximum share followed by primary sector, the two together accounting for about 93 per cent of the total capital. Large shares of the tertiary and the primary sector in total capital input are the result of government's deliberate efforts to develop the infrastructural base and high priority accorded to agriculture

during the three plans and annual plans. Relative dec-
line in the shares of primary and tertiary sectors in
total capital input in the latter decade, compared to
the previous one, indicates the shift in emphasis from
agriculture and tertiary sector to the secondary sector
which has yet to play its crucial role in economic deve-
lopment of the State.

Due to the heavy weight acquired by the primary
and tertiary sectors in the total capital input, any
marginal change in the rate of growth capital input in
these sectors would effect the overall growth rate of
capital input more significantly, compared to the changes
in growth rates of capital input in the secondary sector,
which has, but a smaller weight in the total capital
input. It is for this reason, that despite a 13.5 per
cent growth per annum in the secondary sector during
1960-61 to 1970-71, overall growth rate of capital input
in the State kept as low as 4.95 per cent per annum. For
the same reason, a marginal decline of 0.16 percentage
points in the growth rate of the primary sector and 0.16
percentage points decline in the tertiary sector along
with a 7.28 per cent decline in the secondary sector,
lowered the overall growth rate of capital input by 1.01
per centage points only.

Because of data limitations and weaknesses in the methodology used for preparing capital input series, the estimates derived (Table V.4) are rough and need to be used with care. It is expected however that year to year changes in capital input as also the total change during the period would not be much different from that revealed by the series prepared by us (Table V.6) and this only serves as a point of content since when technology is changing continuously, a precise measure of capital increase or decrease is not possible.[51]

3.2 Conclusions

Main conclusions emerging from the analysis are summarised as :

1. During 1960-61 to 1980-81 real capital input in the State economy has grown at an annual compound rate of 4.45 per cent per annum. Its growth has been slower during 1970-71 to 1980-81 in comparison to 1960-61 to 1970-71.

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[51] "Not-with-standing any refinement that may still be possible, with only a vague notion of more or less capital. We must be glad if our measure allows us to distinguish to our common sense satisfaction between two different quantities when the difference is large enough", Cf. Fedrick Lutz, "The Essentials of Capital Theory" in the Theory of Capital, F.A. Lutz and D.C. Hague (eds.), Macmillan, London, 1961, p.16.

2. During the two decades 1960-61 to 1980-81,
   real capital input in the three broad
   sectors primary, secondary and tertiary
   has grown at annual compound rates of 3.09,
   9.45 and 3.72 per cent respectively. In all
   the three sectors rates are lower during
   seventies as compared to sixties.

3. Despite the fact that over the two decades
   secondary sector has revealed the fastest
   rate of growth of capital input in the State
   economy, percentage share of this sector in
   total capital input is the smallest; reflec-
   ting the low level of industrial activity in
   the State. It is encouraging, however, that
   percentage share of this sector has improved
   during seventies as compared to sixties.

Appendix D

This appendix describes the method of estimating
real capital stock series in the agricultural sector
of the State. Different items of the stock mentioned
in the text earlier have been estimated as follows:

Farm Houses

In order to evaluate value of farm houses in the
State at 1970-71 prices information available from AIRDIS
1961-62 and AIDIS 1971-72 has been utilised. These two
survey reports provide the market value of house property
with rural households as on 30th June 1961 and 1971 res-
pectively. Following the procedure adopted by earlier
studies on tangible wealth[1] one-third of the value of

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[1](i) Uma Datta and Vinod Prakash, "An Estimate of
Reproducible Tangible Wealth in India, 1949-50," op. cit.

(ii) M. Mukherjee and N.S.R. Shastry, "An Estimate
of Reproducible Tangible Wealth in India", Review of
Income and Wealth, op. cit.

(iii) Reserve Bank of India, "Estimates of Tangible
Wealth in India", RBI Bulletin, Vol.XXVI, No.10, October
1972.

house property with cultivators and agricultural labour

households[2] after making a 5 per cent discount for the

value of land is assumed to constitute value of stock

in the form of farm houses in rural sector for 1961 and

1971 respectively. Estimates for intervening years

have been obtained after by Interpolating the bench

mark estimates of 1961 and 1971. These have been def-

lated by the index number of cost of rural construction

to obtain the constant price estimates.

As both AIRDIS and AIDIS provide information in

case of rural household sector only, bench mark estimates

of urban value of house property in 1960-61 and 1970-71

have been obtained, assuming that urban value would from

same percentage of rural value, as urban agricultural

workers to rural agricultural workers. A deduction of

10 per cent has been made to account for the value of

land in the urban sector. Estimates for intervening

years have been obtained by interpolation. These have

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[2]While AIDIS gives estimates of house property for
both cultivators and agricultural labour households
separately, AIRDIS provides this information for rural
cultivating households only. Estimates of house property
with agricultural labour households in 1961 has been
estimated, assuming that lowest category in terms of
value of asset holding among the non-cultivator households
consists of agricultural labour households.

been deflated by the index number of cost of construc-
tion in the urban sector, to obtain constant price
estimates. Estimates for rural and urban sectors are
added year-wise, to obtain value of capital in the
form of farm houses for the period 1960-61 to 1970-71.
Value of farm houses in 1970-71, in rural and urban
sectors, have been moved forward with the help of in-
dices of number of residential dwellings[3] in the two
sectors, to obtain estimates for the years 1960-61 to
1980-81.

Agricultural Machinery and Equipments

Two bench mark estimates of the value of agricul-
tural machinery and equipments for 1961 and 1971 have
been obtained from AIRDIS and AIDIS respectively. AIRDIS
1961-62, gives Rs.165.82 crores as market value of
agricultural machinery and equipments with the rural
cultivating households on 30th June 1961. Value of
agricultural machinery and equipments with agricultural

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[3]Prepared by using information given in 1971 and
1981 Census on number of dwellings in rural and urban
sectors of the State.

labour households is estimated as Rs.0.89 crores for the same period.[4]   Value of agricultural machinery and equipments with urban households is assumed to constitute same percentage of rural machinery and equipments as the ratio of urban agricultural workers to rural agricultural workers, thus, yielding a figure of Rs.1.66 crores. Rural and urban estimates add to Rs.168.15 crore.

Using the same procedure, AIDIS gives Rs.466.74 crores as market value of agricultural machinery and equipment on 30th June 1971. Bench mark estimates for 1961 and 1971 so obtained, have been interpolated to obtain estimates for the intervening years. Resulting estimates being at current prices have been deflated by the index number of machinery and transport equipments (given in Appendix Table   D.1) to obtain constant price estimates at 1970-71 prices.

No studies could be available to estimate value of agricultural machinery and equipments for the years 1970-71 to 1980-81. Only information available in respect of

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[4]Method followed for estimating value of agricultural machinery and equipments with agricultural labour households is the same as used in case of farm houses.

agricultural machinery, relates to numbers of different items given by quinquenial Live-Stock Censuses in the State. However, due to their hetrogeneous nature, these items could not be added as such, to obtain the total number of agricultural machinery and equipments for the Census dates. To solve this problem, an agricultural machinery and equipment equivalent has been prepared, by using prices of different items of machinery as weights. Prices for development of these weights have been obtained from the price list of Agro Industrial Corporation Limited, Tal Katora, Lucknow and relate to the year 1984-85. Prices of the items not included in the list of Agro Industrial Corporation Limited have been ascertained from the engineering section of the State Directorate of Agriculture, Lucknow. These prices have been used to combine the different items of agricultural machinery yielding thereby, what may be called Agricultural Machinery Equivalent for the bench mark years 1971-72 and 1977-78. Estimates for the intercensal years have been obtained by interpolation. Estimates of the equivalent for 1970-71 and for the years 1978-79, 1979-80 and 1980-81 have been obtained assuming same percentage growth per annum as between 1972 and 1978. Value of agricultural machinery and equipments

Table D.1 : Showing Number of Agricultural Machinery and Equipments, Their Prices and Weights for Preparing Index of Agricultural Machinery Equipments for the Bench Mark Years 1972 and 1978

Sl. No.	Items of Agricultural machinery	Number of Agricultural machinery and equipments* (in '000)		Prices** in 1984-85	Weights	Agricultural Machinery Equivalent	
		1972	1978			1972 (Col.1 x col.4)	1978 (Col.2 x col.4)
0		1	2	3	4	5	6
1.	Plough	9671	9968	110.00	1.00	9671.00	9968.00
2.	Blade, Harrow or Bakher	1184	463	300.00	2.73	3232.32	1263.99
3.	Puddlers	93	106	800.00	2.27	676.11	770.62
4.	Earth levellers or scrapper	664	5030	325.00	2.95	1958.80	14838.50
5.	Seed drills	207	448	1700.00	15.45	3198.15	6921.60
6.	Maize shellers	63	21	200.00	1.82	114.66	38.22
7.	Carts	2231	2291	3000.00	27.27	60839.37	62475.57
8.	Sugarcane crushers	429	440	3000.00	27.27	11698.83	11998.80
9.	Sprayers & dusters	96	25	500.00	4.55	436.80	113.75
10.	Oil engine pumps for irrigation	206	487	7028.57	63.90	13163.40	31119.30
11.	Electric pumpsets for irrigation	106	172	6580.00	59.82	6340.92	10289.04
12.	Persian wheels or rahats	249	231	2500.00	22.73	5659.77	5250.63
13.	Hand tractor or power tillers	10	1	32000.00	290.90	2909.10	290.90
14.	Four wheeled tractors	28	71	80698.00	733.67	20542.76	52090.57
15.	Mould board disc plough	4	9	3370.00	30.64	122.56	275.76

	1	2	3	4	5	6
16. Disc harrow	8	35	6242.00	56.75	454.00	1986.25
17. Cultivators	11	42	2950.00	26.82	295.00	1126.44
18. Levellers or scrappers	6	36	1417.50	12.87	77.22	463.32
19. Seed-cum-fertilizer drill	2	4	6650.00	60.45	120.90	241.80
20. Seed planter	2	8	4090.00	37.18	74.36	297.44
21. Rotavator	1	1	45000.00	409.09	409.09	409.09
22. Trailer	8	34	12000.00	109.09	872.72	3709.06
23. Others	5	3	725.00	6.50	32.95	19.50
24. Wheat threshers	74	210	10000.00	90.91	6727.34	1909.11
25. Paddy threshers	2	4	5500.00	50.00	100.00	200.00
26. Threshers for other crops	2	1	3500.00	31.82	63.64	31.82
27. Maize shellers (power operated)	4	5	2500.00	22.73	90.92	113.65
28. Combined harvestors	10	1	10000.00	909.09	9090.90	909.09
29. Power chaff cutters	39	95	620.00	5.64	219.96	535.80
30. Other power operated equipments	10	9	1000.00	9.09	90.90	81.81
					159286.42	219739.43
					100.00	137.95

Sources : i) Cols. 1 & 2 – Livestock Census in U.P. 1972 and 1978 respectively.
ii) Col.3 – Price List of Agri Industrial Corporation of India Ltd., Lucknow and engineering section of State Directorate of Agriculture, Lucknow.
iii) For others cols. see the text.

* Crawler tractors and ghanis have been excluded as price information in respect of these items could not be available.

** Wherever different prices for different varieties of the same equipment were available, their simple average has been worked out.

for 1970-71 obtained from AIDIS 1971-72, has been moved forward with the help of Index of Agricultural Machinery Equivalent (See Appendix Table D.2) to obtain estimates for the years 1971-72 to 1980-81.

Table D.2 : Index of Agricultural Machinery Equivalent

Years	Index
1970-71	100.00
1971-72	105.00
1972-73	110.25
1973-74	115.76
1974-75	121.55
1975-76	127.63
1976-77	134.01
1977-78	144.36
1978-79	151.58
1979-80	159.16
1980-81	167.16

Source : See the text.

Livestock

Estimates of number of animals under different categories were available from different livestock Censuses in the State. Bench mark estimates available for 1961, 1966, 1972 and 1978 Censuses have, been interpolated to find the number of animals for inter-Censal years. Number of animals under different categories each year from 1978 to 1981 have been obtained by assuming same percentage growth as obtained from the livestock Censuses during 1972 and 1978. Prices as available from Economics and Statistics Division of the State Planning Institute, U.P. for 1970-71 have been used to evaluate value of total livestock for each year. These prices are reproduced below in Appendix Table D.3.

Table D.3 :

Animals under different categories	Prices in 1970-71
1. Cattle male over 3 years	250.07
2. Milched cow over 3 years	94.10
3. Cows not calved even once	47.63
4. Cattle others	11.10
5. Cattle young stock	69.14
6. Buffaloe male over 3 years	420.76
7. Milched buffaloe over 3 years	410.10
8. Buffaloe not calved even once	209.24
9. Buffaloe others	69.58
10. Pigs	58.95
11. Sheep	39.69
12. Goats	47.93
13. Fowls	4.71
14. Dueks	5.88
15. Others poultry	3.76

Source : Economics and Statistics Division, State Planning Institute, Lucknow, U.P.

Private Irrigation Works

In case of private irrigation works bench mark estimate of capital stock for the rural sector has been obtained from a special survey undertaken in the State, by Economic and Statistics Division of the State Planning Institute in 1969-70, published under the title "Capital Formation in Rural Sector of Uttar Pradesh[5] a special survey". The report gives Rs. 290.89 crores as the value of the private irrigation works (includes private wells only) in the State as on 30th June 1970. Value of private irrigation works in the urban sector is estimated, in the same manner as in case of farm houses and agricultural equipments, described earlier. The two estimates have been deflated by the index of cost of construction in rural and urban sectors respectively, to convert them at 1970-71 prices. Net stock of capital in the form of private irrigation works comes to Rs. 306.08 crores in 1969-70. Estimates of net capital stock for other years have been obtained by carrying backward and forward the bench mark estimate for 1969-70 with the help of index of net area irrigated by private wells in the State.

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[5] Capital Formation in the Rural Sector of Uttar Pradesh (in Hindi), op. cit.

Public Irrigation

In order to obtain series of capital stock in public irrigation, use of capital outlay figures available from State Irrigation Department has been made. The first step has been to estimate not capital stock for the bench mark year 1960-61. For this purpose average life of public irrigation works is assumed to be 50 years. On the basis of this assumption it can easily be concluded that capital stock in 1960-61 would not constitute capital older than 1911. Net investment in public irrigation during 1910-11 to 1938-39 (after making a 2 per cent allowance for depreciation) have been aggregated to obtain net capital stock in 1938-39. This value is expected to be pretty close to its current value, as the index of general price level and so presumably the cost of construction index did not reveal any marked change during 1910-11 to 1938-39*. For the latter period upto 1960-61, net investment each year has been deflated by the index number of cost of

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[6]See 1) Tara Shukla, Capital Formation in Indian Agriculture, Vora & Company, Bombay, 1965, pp. 131-138.

2) M. Mukherjee and N.S.R. Shastry, Review of Income and Wealth, 1959, op. cit., p. 386.

construction in the urban sector to convert them at constant 1960-61 prices. Resulting accumulated figure when added to the net capital stock in 1938-39 provides an estimate of net capital stock in the form of public irrigation works in the year 1960-61.

Since we require series of real capital stock at 1970-71 prices for the period 1960-61 to 1980-81, the 1960-61 estimate of net capital stock has been converted at 1970-71 prices by shifting the base of the index of cost of construction at 1970-71 = 100.

Estimates of capital stock for other years during the reference period have been obtained using the identity.

$$K_t = K_{t-1} + I_t$$

where,
K_t = net capital stock in year t.
K_{t-1} = net capital stock in year t-1.
I_t = net investment in year t.

All valued at constant prices.

Estimates of various items in the capital stock for the agricultural sector have been presented in Appendix Table D.4.

Table D.4 : Capital Input in the Primary
Sector : Asset-wise Growth
(at 70-71 prices)

(Rs in Crore)

Years	Farm houses	Machinery & equipment	Live-stock	Private irriga-tion	Public irriga-tion	Invento-ries
1960-61	775.13	261.59	765.15	319.54	311.60	213.82
1961-62	817.41	281.99	768.54	321.47	325.24	211.47
1962-63	821.28	293.12	772.21	323.40	345.24	200.67
1963-64	878.19	315.90	775.97	325.74	368.60	188.26
1964-65	920.94	335.57	779.92	325.76	396.79	227.17
1965-66	937.95	351.74	783.88	353.60	429.65	208.88
1966-67	953.18	360.08	789.67	380.61	438.92	178.19
1967-68	969.42	393.89	794.16	401.94	459.48	218.46
1968-69	979.82	431.31	799.90	423.28	495.32	212.55
1969-70	992.70	453.63	805.82	443.19	534.02	235.27
1970-71	1006.27	466.74	811.93	483.96	573.57	248.60
1971-72	1022.70	490.08	817.41	491.83	625.53	224.26
1972-73	1039.37	514.58	825.76	499.70	660.39	238.84
1973-74	1056.36	540.29	833.27	519.95	725.97	221.70
1974-75	1073.67	567.32	841.51	540.20	787.50	239.31
1975-76	1091.32	595.70	856.83	548.76	841.45	262.62
1976-77	1109.19	625.48	865.80	562.63	910.21	265.59
1977-78	1127.39	637.79	868.04	577.12	982.21	289.12
1978-79	1145.03	707.48	877.03	626.32	1012.26	291.92
1979-80	1163.88	742.86	886.14	613.42	1037.44	215.81
1980-81	1183.60	780.20	895.52	600.52	1067.03	303.24

Source : See the text.

Table .D.5 : Indices of Prices of
Capital Goods

Years	Index of cost of construction		Index number of machinery & transport equipment	Index number of wholesale prices
	Rural	Urban		
0	1	2	3	4
1960-61	59	58	64.28	54.07
1961-62	63	61	66.01	55.80
1962-63	66	64	70.30	58.09
1963-64	66	65	72.21	60.07
1964-65	68	68	75.25	63.05
1965-66	72	73	79.47	67.27
1966-67	77	78	85.94	80.52
1967-68	81	83	87.19	92.63
1968-69	87	87	87.92	92.24
1969-70	95	94	92.54	94.20
1970-71	100	100	100.00	100.00
1971-72	110	110	105.30	105.60
1972-73	118	118	112.10	116.20
1973-74	132	132	122.70	139.70
1974-75	160	160	156.40	174.90
1975-76	172	172	172.40	173.00
1976-77	186	186	170.10	176.60
1977-78	191	191	179.80	185.80
1978-79	207	207	207.20	185.80
1979-80	247	247	259.10	217.60
1980-81	280	280	262.10	257.30

Sources : Col.1 and col.2 - Uma Datta Roy Choudhury,*
"Industrial Breakdown of Capital Stock in
India", The Journal of Income and Wealth,
Vol.1, No.2, April 1977, p.154.
Col.3 and Col.4 - Office of the Economic
Advisor, Government of India,(published in
monthly Bulletins of Reserve Bank of India).

* After 1970-71 these indices have been extended upto
1980-81 on the basis of building cost Index obtained
from Yojna Monitoring and Cost Management Division,
State Planning Institute, Uttar Pradesh, Lucknow.

Table D.6 : All-India Capital-Output Ratio

Sectors	1960-61	(at 70-71 prices) 1970-71	1980-81
Forestry	.298	.59	.89
Fishery	1.12	1.30	2.06
Mining & quarrying	1.41	2.62	6.70
Construction	1.45	1.19	1.37
Railways	16.34	20.65	17.96
Transport by other means	6.71	6.50	5.18
Communication	3.74	4.22	4.26
Trade, hotels & restaurants	2.64	2.01	1.09
Banking and Insurance	1.09	.81	.80
Other services	1.43	1.72	1.95

Source : P.R. Bramhananda, Productivity in the Indian
Economy : Rising Inputs for Falling Outputs,
Himalya Publishing House, 1982.

Table D.7 : Estimated Capital Output Ratios
in Unregistered Manufacturing

Period	Average Capital-Output Ratio (at 1970-71 prices)
1960-61 to 1962-63	0.3459
1963-64 to 1965-66	0.3770
1966-67 to 1968-69	0.4456
1969-70 to 1971-72	0.4809
1972-73 to 1974-75	0.5679
1975-76 to 1977-78	0.4850
1978-79 to 1980-81	0.4819

Source : As per methodology discussed in the text.

Appendix E

Growth of Land Input in U.P.

Land as a factor of production occupies a distinct
place among the primary factors needed for production
of goods and services. Land is different from capital,
not because it is a 'free gift of nature' as Marshall[1]
believed, but because it is relatively immobile and in-
elastic in supply, and has a some-what negative rate of
depreciation and obsolescence[2]. Land derives importance
from its innate qualities such as fertility, possession
of minerals etc. and also due to its locational advantage.[3]

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[1]Marshall, Principles of Economics : An Introduc-
tory, Vol.VIII, edition, Macmilland & Company Ltd., St.
Martin's Street, London, 1938, p.138.

[2]"It (land) can be kept permanently in good order
by a relatively small expenditure of resources on running
repairs (hedging and ditching) and that it can be put to
a wide variety of uses, so that it is not much subject
to wear and tear and the obsolescence due to change in
demand for its services that limits the useful life of a
machinery. At the same time in a settled country, it is
very expensive if not physically impossible to increase
the supply of land (as for instance by draining fence
or irrigating deserts). Consequently the supply of land
varies much less than supply of most kinds of capital
goods in response to changes in income that can be got
by owning it ..... Land is often subject to a kind of
negative obsolescence as when the development of a new
crop turns formerly useless jungles into rich productive
resources". J. Robinson, The Accumulation of Capital,
Macmillan, IIIrd edition, 1969, pp.12-13.

[3]E.F. Denison, Sources of Economic Growth in the
United States and the Alternatives Before Us, Supplemen-
tary Paper No.13, Committee for Economic Development, New
York, 1962, p.87.

Importance of land as a factor of production is all
the more greater in the production system of a predomi-
nently agricultural economies with high rate of popu-
lation growth where increased demand for food and other
necessaries, make it even more scarce.

The concept of land to be used for measuring sources
of growth has been some what controversial. The contro-
versy exists as to whether the total land available to
the economy or the land in actual use should be used
for measuring input of land in the production. E.F.
Denison[4] uses the concept of total available land. As
total land available in the economy for use is not likely
to change under usual circumstances his index of land
input does not diverge from 100. However, in many other

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[4] (i) E.F. Denison, Sources of Economic Growth in the
U.S., op. cit., p.90.

(ii) E.F. Denison, Accounting for the United States
Sources of Economic Growth, 1929-1969, The Brooking
Institution, Washington, p.57.

studies[5] on sources of economic growth, the concept of
land input used is that of land actually in use.

While it is true that total land available to the
economy remains almost fixed, its quantity in actual
use does change with time due to technical advancement
and investment of more capital. Denison[6] while recogni-
sing that increase in land area in actual use by brin-
ging into use, land that was previously unused or which
had little economic value is likely to make a positive
contribution to the growth of output, justifies his stand
for using 'land available' concept, on the ground that
share of land in net output in the United States being a
very small percentage of net output, use of either con-
cept is not likely to effect his results. However, in

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[5](i) J. Schmookler, "The Changing Efficiency of the
American Economy 1869-1938", Review of Economics and
Statistics, Vol.34, No.3, August 1952, pp.214-231.

(ii) M. Abramovitz, "Resource and Output Trends in
the U.S. since 1870", The American Economic Review, Vol.46,
No.2, May 1956, pp.5-23.

(iii) R.M. Solow, "Technical Change and the Aggregate
Production Function", Review of Economics and Statistics,
Vol.39, No.3, August 1957, pp.312-320.

[6] E.F. Denison, op. cit., pp.90-91.

case of India and so also for Uttar Pradesh which are
predominantly agrarian economies relative share of land
in net output is quite large. For Uttar Pradesh share
of land during 1960-61 to 1980-81 works out to be around
60 per cent of net domestic product. Empirical studies
also confirm that increase in land area has made a
significant contribution to the growth of agricultural
output in the State.[7] and at the national level.[8] Land
area in agriculture in the State is increasing though
with a declining rate. It, therefore, appears more
appropriate to use the concept of land in actual use
rather than available land for use,as a measure of land
input for the present study.

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[7]By decomposing growth rates of crop output into
components of area yield and cropping pattern V.N.
Misra's study reveals that during 1950-53 to 1956-59
area accounted almost entire growth in crop output.
Its contribution in subsequent periods i.e., 1956-59
to 1962-65, 1962-65 to 1968-71 and 1968-71 to 1974-77
worked out as 12, 17 and 3 per cent respectively show-
ing somewhat a declining trend. See, V.N. Misra, "Anatomy
of Agricultural Growth" in T.S. Papola et.al.(eds.),
Studies on Development of Uttar Pradesh, GIDS, Lucknow,
1979, pp.1-57.

[8]Growth Rates in Indian Agriculture, Directorate
of Economics and Statistics, Ministry of Food and Agri-
culture, Govt. of India, 1967.

Index of land input in this study measures only

the growth in net sown area and fallow land.[9] While

use of this measure does not raise any problems for

the agricultural sector (or the primary sector as de-

fined in our study) it certainly fails to take into

account growth in land area in other sectors of the

economy. In this sense it is a partial measure of land

input. This is not of course, to ~~deny~~ *suggest* that increase

in land area makes no contribution to the growth of

output at all in sectors other than agriculture but

that it is only in agriculture that land derives value

even without much investment made on it, and earnings

of land can be separated from the earnings of capital.

In all other sectors of the economy it is rather diffi-

cult, if not impossible, to identify and separate out

the earnings of land from that of capital, as much of

the appreciation in land values is due to heavy invest-

ment made on it, in the form of buildings and structures.

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[9]Tara Shukla in her study Capital Formation in Indian
Agriculture uses the concept of net sown area and fallow
land for the purpose of the study. B.H. Dholakia also uses
the same concept for measuring land input in agriculture.
See, Tara Shukla, Capital Formation in Indian Agriculture,
Vora & Co., Bombay, 1965. B.H. Dholakia, Sources of Econo-
mic Growth in India, op. cit., pp.191-192.

In the absence of any information about Govt. land in the
form of roads, parks, bridges etc. Dholakia assumes that
half of the land under the category 'non-agricultural' land
constitutes Govt. land. See, B.H. Dholakia, Sources of
Economic Growth in India, op. cit., pp.191-192.

Thus, increase in the quantity of land in all other sub-
sectors is assumed to be included in the measure of
capital in those sectors. Further, land used for non-
agricultural purposes has increased only by 80 per cent
during the study period 1960-61 to 1980-81.[10] A sub-
stantial part of this increase must have been due to
increase in land area for residential houses and for
government land under roads, parks and bridges etc. which
are not part of this study. Remaining increase in land
area under commercial purposes, is not likely to be
so much as to effect the measure of land input in the
economy, because of its small weight in total land area
in use, in the economy.[11] Hence our index of land input
prepared by measuring the increase in net sown area and
fallow land,measures the growth of land input in the
economy. Statistics of land utilisation issued by Board
of Revenue and Directorate of Agricultural Statiscs,
Deptt. of Agriculture, Uttar Pradesh available for all

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[10]"Classification of Land Utilisation Statistics U.P."
in Agricultural Statistics in U.P. Directorate of Agricul-
ture, Govt. of U.P. (different issues).

[11]During the year 1960-61 only 6.48 per cent of the
reported land area in the State was under non-agricultural
uses. This percentage has not changed significantly over
the twenty years period 1960-61 to 1980-81. In the year
1980-81 only 7.54 per cent of the reported land area was
under non-agricultural purposes. See, Classification of
land Utilisation Statistics in U.P. in Agricultural
Statistics in U.P., op. cit.

years from 1960-61 to 1980-81 have been used. The
index prepared has been shown in Table E.1.

Table E.1 : Index of Land Input in U.P.

Year	Net sown area and current fallow land (in '000 hectares)	Land input (index)
1960-61	17362	100.00
1961-62	17444	100.47
1962-63	17434	100.41
1963-64	17452	100.52
1964-65	18118	104.35
1965-66	18237	105.04
1966-67	18259	105.17
1967-68	18323	105.54
1968-69	18138	104.47
1969-70	18141	104.49
1970-71	18175	104.68
1971-72	18215	104.91
1972-73	18121	104.37
1973-74	18080	104.14
1974-75	18164	104.62
1975-76	18163	104.61
1976-77	18268	105.22
1977-78	18329	105.57
1978-79	18413	106.05
1979-80	18412	106.05
1980-81	18391	105.93

Source : Agricultural Statistics in U.P., op. cit.

Extremely slow growth of land input in the economy during 1960-61 to 1980-81 (5.93 per cent) is evident from Table E.1. Growth rates during different time periods have been presented in Table E.2.

Table E.2 : Growth Rate of Land Input in U.P.

Period	Rate of Growth
1960-61 to 1980-81	.29
1960-61 to 1970-71	.46
1970-71 to 1980-81	.12

Source : Table E.1.

Chapter VI

MEASURING THE CONTRIBUTION OF SOURCES OF GROWTH OF REAL INCOME IN UTTAR PRADESH

This chapter is aimed at measuring the contribution of various sources to the growth of real income in the State economy during the period of two decades from 1960-61 to 1980-81. The sources of growth have been classified under two major heads - (i) conventionally measured inputs, and (ii) technical change. The conventionally measured inputs are the trinity of the primary factors — land, labour and capital. The term technological change refers to all those sources which lead to changes in technology and thereby help to produce (i) quantitatively more, and (ii) qualitatively superior output per unit of given resources.[1] While the qualitative aspect is in no way less important than the quantitative aspect,[2] problems involved in measurement of the former compell us to confine the analysis to the

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[1] N. Rosenberg, <u>Inside the Black Box : Technology and Economics</u>, Cambridge University Press, 1982, p.1.

[2] Ibid, p.2.

quantitative aspect only. Quantitative importance of various sources of growth has been assessed using growth accounting technique in the neo-classical frame work. The chapter has been presented into two sections; Section 1 : deals with theoretical base of measurement and Section 2 : deals with measurement and analysis of sources of growth.

1. <u>Theoretical Basis of Measuring Contribution of Conventionally Measured Inputs and Total Factor Productivity</u>*

The main premise behind the growth accounting ex-cercise is that growth in output is the result of growth in factor quantities and growth in factor productivities. Thus by measuring the growth rate of total factor quanti-ty and total factor productivity, the growth rate of real income can be totally accounted. The term "total factor quantity" refers to the increase in the primary factors'.

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* There are various names given to the term "total factor productivity" such as technical change, measure of effi-ciency, measure of our ignorance, output per unit of resource input and residual etc.

land, labour and capital. The term "total factor pro-
ductivity" refers to the combined efficiency of the
measured inputs or growth in output per unit of total
factor input. This part of growth stems from a number
of sources such as increased education of the work force,
improvements in managerial skill, changes in resource-
shifts, economies of scale etc. These sources are in-
numerous and invisible and it is difficult to identify
and measure them presisely by any conventional yardstick.
Hence their combined contribution to the growth is
measured as a residual which remains from the growth
rate of income after subtracting the contributions of
conventionally measured inputs. The growth accounting
excercise is, therefore, concerned with separating out
growth due to quantity increase from that due to produc-
tivity increase.

Total factor productivity measures can be deduced
either from the distributive theory or from the explicitly

assumed production functions.[3] In both cases production function serves as the basis.

In the early post-War research on productivity growth total factor productivity measures used were the standard sort of output per unit of resource input measures. The well distinguished studies in the field by Schmookler[4], Abramovitz[5], and Kendrick[6] for the

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[3]For different approaches of measuring total factor productivity, see :

(i) M.I. Nadiri, "Some Approaches to Theory and Measurement of Total Factor Productivity : A Survey", The Journal of Economic Literature, Vol.VIII, No.4, December 1970, pp.1137-77.

(ii) Ronald W. Conley, "Some Remarks on Methods of Measuring Importance of Sources of Growth", The Southern Economic Journal, Vol.25, July 1968-April 1969, pp.224-28.

(iii) E.D. Domar, "On Measurement of Technological Change", Economic Journal, Vol.LXXI, December 1961, pp.709-729.

(iv) E.D. Domar, "On Total Factor Productivity and all That", Journal of Political Economy, December 1962, pp.597-608.

(v) K.L. Krishna, "Total Factor Productivity : Concept and Measurement", Productivity, Vol.10, No.4, Jan-March, 1970, pp.701-706.

[4]J. Schmookler, "The Changing Efficiency of the American Economy, 1869-1938", Review of Economics and Statistics, Vol.34, No.3, August 1952, pp. 214- 231.

[5]M. Abramovitz, "Resource and Output Trends in the United States since 1970", American Economic Review, Vol.46, No.2, May 1956, pp.5-23.

[6]J.W. Kendrick, Productivity Trends in the United States 1948-69, Princeton University Press, Princeton, 1961.

United States were based on this simple index.[7] The
fact that different components of total factor input
grow at different rates over time was taken care of
by weighting the input indexes with the help of factor
prices. Neither the assumption of profit maximisation
nor that of competetive equalibrium and full employment
were postulated. Solow however pointed out that "it
might seem at first glance that calculations of output
per unit of resource input provide a relatively assump-
tion free way of measuring productivity changes.
Actually I think the implicit load of assumptions is
quite heavy".[8] Using the explicit assumption of an
aggregate production function he was able to show that
the standard measure of output per unit of resource
input had in the background assumptions of (i) neutral
technical change (ii) perfect competition and strictly
linear aggregate production function.[9]

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[7]Kendrick's index for the year t may be written
as

$$A_t = \frac{Y_t}{w_o L_t + r_o K_t}$$

where, Y, L and K denote the values of real output, labour
and capital and w_o and r_o denote the factor rewards of
labour and capital in the base year.

[8]R.M. Solow, "Technical Change and Aggregate Produc-
tion Function", The Review of Economics and Statistics,
Vol. 39, August 1957, pp. 312-320.

[9]Ibid.

Production function is a micro concept. A production function is a relationship between inputs, output and technology. Given the assumption of perfect competition in product and factor markets, equality of factor price and marginal products and profit maximising behaviour of the firm, increase in output resulting from a small increase in only one input keeping others constant will be the same as the share of that input in total factor return. Thus, for any growth in inputs, output would grow proportionately along the production function. Residual, if left, would measure the shift in production function or technical change.[10]

A production function portrays all the efficient production techniques existing at a given time. A shift in the function can also occur due to application of previously known but unused techniques. Such a 'shift in the strict sense should not be confused with technical change. In practice "it is not always possible

[10]R.R. Nelson, "Research on Productivity Growth and Productivity Differences : Dead Ends and New Departures", Journal of Economic Literature, Vol.XIX, September 1981, pp. 1029-1064.

to operate with such purity to distinguish movements
in efficiency due to movements towards known production
boundaries, from the expansion of the boundaries them-
selves",[11] unless the assumption of neutral technical
change is made.[12]

Though essentially a micro concept the characteris-
tics obtained for micro production function have been
postulated for macro functions also. To conceive of
such a function at the economy level gives rise to

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[11] C. Kennedy and A.P. Thirlwal, "Technical Progress:
A Survey", _Economic Journal_, Vol.82, No.325, March 1972,
pp.11-12.

[12] Technical change is said to be neutral if the
shift in the production function is such that the bala-
nce between capital and labour in the current produc-
tion i.e. factor shares remain undisturbed. Three
types of neutrality have been discussed in literature
(i) Harrod neutrality, (ii) Solow neutrality, (iii) Hicks
neutrality. Technical change is Harrod neutral when the
shift in the function is such that capital output ratio
remains the same. It is Solow neutral if production
function shifts in such a manner that labour output ratio
remains constant. Technical change is said to be neu-
tral in Hicksian sense when for a given capital labour
ratio marginal rate of substitution between capital and
labour does not change with change in technology, See :

(i) Paul Stoneman, _The Economic Analysis of Technolo-_
gical Change, Oxford University Press, 1963, pp.4-7.

(ii) Arnold Heertje, _Economics and Technological_
Change, Weidenfield and Nicolson, London, 1979, pp.161-72.

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serious problems of aggregation. Aggregation of micro-economic functions into corresponding macro-economic function even in the most simple case where all enterprises produce homogenous end products with the help of only one capital and same labour, is possible only if the micro functions can be decomposed into two parts, separately for the use of labour and capital.[13] Problems are naturally more acute when different economic units produce hetrogeneous products with the help of hetrogeneous inputs. Led by these problems some economists cast doubts on the existence of such an aggregate function. Walter, for example, remarks "After surveying the problem of aggregation, one may easily doubt whether there is much point in employing such a concept as aggregate production function. The variety of competetive and technological conditions we find in modern economies suggest that we can not approximate the basic requirement of sensible aggregation except perhaps over firms in the same industry or for the narrow sections of the economy".[13] Some economists[14] however believe

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[13] A.A. Walters, "Production and Cost Function an Econometric Survey", Econometrica, Jan-April 1963, p.11.

[14] (i) A.P. Thirlwal, Growth and Development with Special Reference to Developing Economies, English Language Book Society/Macmillan, 1985, p.67.

(ii) Arnold Heertje, Economics and Technical Change, op. cit., p.171.

that these problems are not so acute as to suggest
abandoning the function altogether. Thus, despite the
criticism levelled against the aggregate concept, the
function in implicit and explicit forms has been used
extensively for exploring sources of growth in different
economies.[15]

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[15]Some of the important studies are :

(i) J. Schmookler, "The Changing Efficiency of the American Economy 1869-1938", op. cit., pp.214-231.

(ii) M. Abramoritz, "Resource and Output Trends in the United States since 1870", op. cit., pp.5-23.

(iii) J.W. Kendrick, Productivity Trends in the United States 1948-1969, op. cit.

(iv) R.M. Solow, "Technical Change and the Aggregate Production", op. cit., pp.312-320.

(v) E.F. Denison, Sources of Economic Growth in the United States and Alternatives Before Us, Supplementary Paper 13, Committee for Economic Development, New York, 1962.

(vi) E.F. Denison, Why Growth Rates Differ : Post-War Experience of Nine Western Countries, The Brookings Institution Washington, 1967.

(vii) E.F. Denison, Accounting for United States Sources of Economic Growth 1929-1969, The Brookings Institution, Washington, 1969.

(viii) H.J. Bruton, "Productivity Growth in Latin America", American Economic Review, Vol.LVII, December 1967, No.5, pp.1099-1116.

(ix) H. Correa, "Sources of Economic Growth in Latin America", Southern Economic Journal, Vol.XXXVII, No.1, July 1970, pp.17-31.

(x) S. Robinson, "Sources of Growth in Less-developed Countries : A Cross Sectional Study", Quarterly Journal of Economics, Vol.LXXV, August 1971, No.3, pp.391-408.

(xi) B.H. Dholakia, Sources of Economic Growth in India, Goods Companion, Baroda, 1974.

Assumption of aggregate production function provides the basic frame work for assessing the contributions of various sources to the growth of output. Various forms of production function have been proposed and used for empirical study. For the purpose of present study we start by assuming the set of most convenient conditions of (i) neutral technical change, (ii) perfectly competetive equilibrium conditions, (iii) equality of factor price and marginal product, and (iv) constant returns to scale. These conditions imply that we implicitly assume a function of the form :

$$Q = A(t) \quad f \quad (K, L) \qquad \dots (1)$$

where, f (K,L) is homogeneous of degree 1 and
$\quad$ Q $\quad$ = $\quad$ Output
$\quad$ K $\quad$ = $\quad$ Capital (inclusive of land)
$\quad$ L $\quad$ = $\quad$ Labour

All measured in physical terms.

The multiplicative term A(t) measures the cumulated effect of shifts over-time.

Differentiating (1) with respect to (t) and dividing by Q we get :

$$\frac{\dot{Q}}{Q} = \frac{\dot{A}}{A} + \frac{1}{f} \left[K \cdot \frac{\delta f}{\delta K} \cdot \frac{\dot{K}}{K} + L \frac{\delta f}{\delta L} \cdot \frac{\dot{L}}{L} \right] \qquad (2)$$

where dots denote time derivatives.

$$\text{Defining} \quad WK \quad = \quad \frac{\delta f}{\delta K} \cdot \frac{K}{f}$$

$$\text{and} \quad WL \quad = \quad \frac{\delta f}{\delta L} \cdot \frac{L}{f}$$

and substituting in eq (2) we get

$$\frac{Q^{\circ}}{Q} \quad = \quad \frac{A^{\circ}}{A} \quad + \quad WK \cdot \frac{K^{\circ}}{K} \quad + \quad WL \cdot \frac{L^{\circ}}{L}$$

i.e. growth rate of output is equal to the growth rate of technological change plus the weighted sum of the growth rate of factor inputs; weights being the shares of inputs in total factor return.

As mentioned earlier, Kendricks' index of measuring total factor productivity, used factor prices to weight the input indices, "with no elaborate justification of this as means of tracking movements along a production function".[16] Factor prices measure the contribution of a factor to the growth of output only at the margin. But in growth accounting studies dealing with long periods when percentage changes in inputs and output are substantial, marginal productivity of any factor is not independent of the rates of growth of other factors. Nelson has rightly observed that "the fact that yearly increases in labour, capital and gross national product are typically

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[16] R.R. Nelson, op. cit, p.1058.

quite small should not obscure the fact that even over a period as short as a decade, the percentage changes are substantial. If there is any curvature to the isoquant, the marginal productivity of any factor towards the end of the decade, is influenced by the relative growth of different factors, over the decade. This is a well known defficiency with analysis of growth based on factor price weighted index".[17] Use of factor shares in place of elasticity of substitution rather than factor prices to estimate the marginal products is definitely superior because "even though the marginal productivity of a factor falls as it increases relative to other factors along a production function, its share need not".[18]

In this implicitely assumed form of production function contribution of any measured input to the growth rate of output is obtained as the product of the growth rate of input and its share in total output. The contribution of technological change is obtained by subtracting the total contribution of measured inputs from the growth rate of output. Being obtained as residual total

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[17] R. R. Nelson, op. cit, p. 1053.

[18] Ibid.

factor productivity or technical change includes the set of all intangible sources like education, health improvements, resource utilization, resource shifts economies of scale etc. It also includes the errors in the measurement of inputs and output.

The assumption of constant returns to scale does not actually mean that economy during the period under consideration was operating under constant returns. It only implies that effects of increasing or decreasing returns would be manifested in the measure of Total Factor Productivity[19] or technical change; biasing it upward in case of increasing returns and downwards in case of decreasing returns.

The assumption of perfectly competetive equilibrium and equality of factor prices with their marginal products are hard to justify in case of the economy under study here. Due to prevalence of large scale disguised unemployment, marginal product of labour is likely to diverge from its price. However, given the assumption of rationality on the part of economic units and the

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[19]Hereafter referred as TFP only.

fact that many empirical studies dealing with these assumptions have yielded satisfactory results, provide a reasonable basis for analysis.

2. Measurement and Analysis of Sources of Growth

In the exercise of measurement of the sources of growth for the State economy, the first step is to separate the contribution of total factor input and total factor productivity from the growth rate of real output (SDP) by constructing an index of total factor input with the help of input indices prepared in earlier chapters. Absolute and relative contributions of 'total factor input' and its main constituents to the growth rate of SDP would then be measured.

This part of the chapter has accordingly been divided into four sub-sectors. Section 2.1 measures the contribution of 'total factor input' and its components to the growth of real SDP assuming technical change to be purely disembodied; Section 2.2 presents sectoral analysis of the sources of growth; Section 2.3 attempts measurement and analysis of the sources of growth with labour embodied technical change and Section 2.4 summarises main conclusions of the analysis.

2.1 <u>Contribution of Total Factor Input</u> : Total factor
input index or more accurately multi-factor input index[20]
which embodies all the measured inputs growing at diffe-
rent rates overtime is crucial for any excercise on
sources of economic growth.

The index of total factor input[21] for the economy
of U.P. during 1960-61 to 1980-81 has been prepared as
a weighted sum of the indices of three conventional
inputs — labour, capital and land prepared earlier in
chapters IV and V. For combining these inputs the set
of weights used are the relative income shares of the
three factors in SDP estimated in chapter III. Due to
the established superiority of the changing weight index
over the fixed weight index.[22] the sets of weight used
have been changed after every five years. The choice
of quinquennium for using the same set of weights is
"to see that the marginal product weights assigned to

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[20]The index of total factor input usually fails
to account for all the inputs used in production. Hence
some people prefer to call it multi-factor input index
instead of total factor input index, see, K.L. Krishna,
op. cit, pp.701-706.

[21]Hereafter reffered as TFI only.

[22]E.F. Denison, <u>Sources of Economic Growth in
United States</u>, op. cit., p.140.

different factors of production are changed often
enough to catch the persistent changes but not so
often as to allow cyclical fluctuations in income
shares to cause the results to be sensitive to the
particular year in which the quantity of a factor
increases".[23] The index of TFI along with indices
of its individual components has been shown in Table
VI.1. Corresponding growth rates along with the growth
rates of real SDP have been shown in Table VI.2.

Table VI.1 : Index of Total Factor Input
and Its Components

Years	Labour	Capital	Land	T F I
1960-61	100.00	100.00	100.00	100.00
1961-62	100.95	103.58	100.47	101.31
1962-63	101.91	106.07	100.41	102.34
1963-64	102.88	114.35	100.52	104.40
1964-65	103.85	121.07	104.35	106.92
1965-66	104.84	127.36	105.04	108.79
1966-67	105.84	131.62	105.17	110.16
1967-68	106.84	137.90	105.54	111.95
1968-69	107.86	145.30	104.47	113.60
1969-70	108.88	153.18	104.49	115.58
1970-71	109.97	162.14	104.68	117.70
1971-72	111.64	168.42	104.91	119.97
1972-73	113.55	174.79	104.37	122.10
1973-74	115.49	180.93	104.14	124.26
1974-75	117.25	188.66	104.62	128.52
1975-76	119.03	198.69	104.61	131.56
1976-77	120.84	204.91	105.22	133.99
1977-78	122.68	213.77	105.57	136.89
1978-79	124.54	224.26	106.05	140.14
1979-80	126.43	229.52	106.05	142.35
1980-81	130.34	238.70	105.93	146.98

Source : See the text.

[23] B.H. Dholakia, Sources of Economic Growth in
India, op. cit, pp.204-205.

Table VI.2 : Average Compound Growth Rates of
Inputs   Output and Total
Factor Productivity

Input/ Output	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1967-68	1967-68 to 1974-75	1974-75 to 1980-81
					(in per cent per annum)	
Labour	1.33	0.95	1.71	0.95	1.34	1.78
Capital	4.45	4.95	3.94	4.69	4.58	4.00
Land	0.29	0.46	0.12	0.77	-0.12	0.21
T F I	1.94	1.64	2.25	1.63	1.99	2.26
T F P	0.77	0.90	0.63	-0.29	0.20	2.71
Output	2.71	2.54	2.88	1.34	2.19	4.97

Source : See Table VI.1.

2.1.1 Changes in Total Factor Input : Table VI.1 shows
that during the twenty years period, 1960-61 to 1980-81,
TFI has grown by nearly 47 per cent i.e. at an average
compound rate of 1.94 per cent per annum. From the
growth rates given in Table VI.2 it is also apparent
that TFI has tended to increase with the passage of time;
growth rate in each successive period being higher than
in the preceding one. During the first decade i.e. 1960-61
to 1970-71, total factor input grew at an average compound

rate of 1.64 per cent per annum, while during the second decade it grew at an average compound rate of 2.25 per cent per annum. Different sub-divisions of the time period 1960-61 to 1980-81 also reveal an acceleration of the growth rate of TFI over-time.

As TFI is the weighted sum of the factor inputs, labour, capital and land, reasons for increasing rate of growth of TFI are to be found in the growth rates of factor inputs and changes in the relative shares of factor inputs in the value added.

A close look at Table VI.2 reveals a marked similarity in the growth pattern of total factor input and labour input; growth rates of both increasing during successive time periods. Growth rates of other two inputs namely capital and land reveal opposite trends. As labour input also acquired the largest share of value added during the reference period 1960-61 to 1980-81 and in each of the sub-periods, 1960-61 to 1970-71; and 1970-71 to 1980-81, it follows that labour input has been the dominent component of TFI during the period under consideration. While growth rates of other two inputs, namely capital and land have declined during 1970-71 to

1980-81, compared to the previous decade, because of their low weights in terms of income shares, these inputs have not been successful in generating any appreciable impact on the growth of TFI.

Despite the upward tendency revealed by TFI it is interesting to note that, of the two major components of TFI namely labour and capital, the rise in the growth rate of labour has been associated with a fall in the growth rate of capital, reflecting the substitution of labour for capital in the growth process.

2.1.2 <u>Sources of Economic Growth</u> : <u>Factor Inputs and Technical Change</u> : Contribution of each component of TFI viz, labour, capital and land is estimated initially as the product of the growth rate of factor input and its relative share in income during the period under consideration. For example, contribution of labour to the growth rate of SDP during 1960-61 to 1980-81 has been estimated as the product of its growth rate (1.33) and its average share in State income during the period (63.19) . Wherever sum of the separate contributions of labour, capital and land, fell short of the measured contribution of TFI to growth rate of SDP, the resulting

difference or the interaction factor, has been allocated among the individual components of TFI, in proportion to the share of each in value added.

Contribution of technological change or TFP to the growth rate of State income has been worked out by subtracting the rate of growth of TFI from the rate of growth of real SDP. Estimated contributions of various sources in absolute and relative terms have been shown in Tables VI.3 and VI.4 respectively.

Table VI.3 : Absolute Contribution of Various Sources to Growth Rate of SDP in U.P.

(in percentage points)

Sources of growth/ Output	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1967-68	1967-68 to 1974-75	1974-75 to 1980-81
Labour	0.99	0.64	1.36	0.65	1.06	1.39
Capital	0.85	0.88	0.80	0.80	0.87	0.81
Land	0.10	0.12	0.09	0.18	0.06	0.06
T F I	1.94	1.64	2.25	1.63	1.99	2.26
T F P	0.77	0.90	0.63	-0.29	0.20	2.71
S D P	2.71	2.54	2.88	1.34	2.19	4.97

Source : See the text.

Table VI.4 : Relative Contribution of Various
Sources in Growth Rate of Real
SDP in U.P.

(in percent)

Sources of growth/ Output	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1967-68	1967-68 to 1974-75	1974-75 to 1980-81
Labour	36.53	25.20	47.22	48.51	48.40	27.97
Capital	31.37	34.65	27.78	59.70	39.73	16.30
Land	3.69	4.72	3.13	13.43	2.74	1.21
T F I	71.59	64.57	78.13	121.64	90.87	45.48
T F P	28.41	35.43	21.87	-21.64	9.13	54.52
S D P	100.00	100.00	100.00	100.00	100.00	100.00

Source : Table VI.3.

Of the two major sources of growth TFI and TFP ac-
counting for the growth rate of real income, former has
been more important than the latter except during 1974-75
to 1980-81. Relative contributions of TFI and TFP during
1960-61 to 1980-81, worked out to 71.59 per cent and 28.41
per cent respectively. Decadal analysis shows that rela-
tive importance of TFI has increased over time while that
of total factor productivity has decreased. Not only
relative contribution of TFP has declined during the

second decade i.e. 1970-71 to 1980-81 compared to the earlier decade i.e. 1960-61 to 1970-71 but also its absolute contribution in percentage points.

As could generally be expected labour and capital have been two major sources of growth of output during 1960-61 to 1980-81. However, over the period contribution of labour is seen to be higher compared to capital. This may be to some extent a reflection of the weakness of the assumption of equality of marginal product of factor and its price because of structural disequilibrium in the labour market so that wages may be in some excess to the marginal product of labour.

Decadal analysis however shows that relative importance of labour and capital as sources of growth had not been uniform during the period 1960-61 to 1980-81. During the first decade capital played more important role, its contribution being 9.45 percentage points higher than that of labour. During the latter decade i.e. 1970-71 to 1980-81 importance of capital as a growth inducing source declined relative to labour. These variations can easily be explained in terms of variations in growth rates of these two inputs given in Table VI.2.

The analysis also brings to light the smallness
of the contribution made by land input to the growth
rate of real SDP in the State. Relative importance of
this input is seen to have declined with time. The
green revolution which emphasised the use of high yiel-
ding varieties, cropping intensity and use of chemical
fertilizers, appears to have been the major factor
accounting for this decline.

Decadal analysis suggests that diminishing returns
have seen in the State economy. A different picture
is, however, revealed if we divide the reference period
into three parts viz., 1960-61 to 1967-68; 1967-68 to
1974-75 and 1974-75 to 1980-81. The break in points
1967-68 and 1974-75 have been choosen since the year
1967-68 represents a year from which onward the new agri-
cultural technology started yielding results. The
second break in point of time 1974-75 has been choosen
as it was the year from which a stable and faster growth
of real income was noticed in the economy.

During the period 1960-61 to 1967-68, total factor
productivity growth turns out to be negative, showing
that although, large investments were made in irrigation,
basic industries and infrastructure development, during

the earlier Five Year Plans, they could not yield returns. Among the factor inputs, capital is observed to have contributed the largest. A 59.70 per cent contribution of capital with a negative 21.64 per cent contribution of technology shows that quality of labour was too poor to absorb the new technology embodied in capital goods. Available evidence for many developed countries reveals that they were successful in achieving high rate of economic growth because they were able to master the technology embodied in new capital goods.[24]

During the period 1967-68 to 1974-75 absolute contribution of capital increased in comparison to 1960-61 to 1967-68. However in relative terms, contributions of both capital and land declined, while that of labour declined only marginally. TFP growth though positive was still very slow, being 0.20 percentage points only showing the slow absorption of technology.

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[24] On the basis of information for ten countries, compiled from P.R. Bramhananda, Productivity in the Indian Economy : Rising Inputs for Falling Outputs, (Himalaya Publishing Co., 1982); S. Hajra concludes that Japan, Germany, Brazil, Argentina and many other countries could accelerate their rate of growth because they could master technology and achieved higher rate of technological progress, S. Hajra, Capital and Technological Progress in the Indian Economy, 1950-51 - 1980-81, Radiant Publisher's, New Delhi, 1985, pp. 18-19.

During the period 1974-75 to 1980-81, TFI becomes
a less important source of growth compared to TFP.
More than fifty per cent of growth in real income
during this period stems from growth of technology.
Labour remains the largest contributory source among
the factor inputs, though, in comparison to the earlier
period contribution of each factor input declined. During
this period rate of growth of real income is slightly
more than the rate of growth of capital input, reflecting
thereby that the economy has started absorbing the
technical change accumulated in the capital goods. During
this period contribution of TFP is more than three times
that of capital input.[25]

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[25]On the basis of Denison's study, Why Growth Rates
Differ : Post War Experience of Nine Western Countries,
The Brooking Institution, Washington, D.C., 1967. S. Hajra
has observed that in majority of the developed countries
studied by Denison, contribution of technological progress
was two to three times that of the contribution of capital.
S. Hajra, op. cit, pp.13-14.

2.2 Sectoral Analysis of the Sources of Growth

The analysis carried so far was in aggregative
terms. Existence of non-homogeneous production func-
tions, different forms of economic organisation and ...
different natural conditions under which production is
being carried out require that analysis of sources of
growth be carried on sectoral basis.[26] In fact such
analysis is imperative for understanding the process
of growth of the economy and hence aggregate produc-
tivity change, admitting of course the fact that sec-
toral analysis is subject to all those critism which
are levelled against the Partial Equilibrium Analysis
of Marshall.[27] This part of the chapter is therefore
concerned with sectoral analysis of the sources of
growth. Three broad sectors distinguished for this
purpose are the primary, secondary and tertiary. Analy-
sis of sources of growth for each of them has been
presented separately in sub-sections 2.2.1, 2.2.2 and
2.2.3.

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[26] Narrottam Shah, "Exploring Sources of Income
Growth in India : A Suggested Conceptual Frame-work",
The Journal of Income and Wealth, Vol.2, No.1, Oct.
1977, pp.72-75.

[27] P.R. Bramahanda, Productivity in the Indian
Economy, Rising Inputs for Falling Outputs, Himalayan
Publishing Company, 1982, pp.113-114.

2.2.1 <u>Primary Sector</u> : Table VI.5 presents average compound rates of TFI and its constituents along with growth rates of sectoral real income during different time periods. Absolute and relative contributions of various sources to the growth rate of sectoral output have been presented in Tables VI.6 and VI.7 respectively.

<u>Table VI.5</u> : Average rates of Sources of Growth and Output : Primary Sector

(per cent per annum)

Sources of growth / Output	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1967-68	1967-68 to 1974-75	1974-75 to 1980-81
1. Labour	1.32	1.32	1.32	1.30	1.33	1.32
2. Capital	3.09	3.17	3.02	2.98	3.30	2.99
3. Land	.29	.46	.12	.78	- .12	.21
4. T F I	1.35	1.44	1.27	1.38	1.25	1.50
5. T F P	.42	.17	.66	- .72	.08	2.40
6. Output	1.77	1.61	1.93	.41	1.33	3.90

Source : Row No. (1) Table IV.11.
                    (2) Table V.5.
                    (3) Appendix Table E.1.
                    (4) Appendix Table F.1.
                    (5) As per methodology discussed in the text.
                    (6) Table II.3.

Table VI.6 : Absolute Contribution of Various
Sources to the Growth Rate of Real
Income (in percentage points) in
the Primary Sector

Sources of growth / Output	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1967-68	1967-68 to 1974-75	1974-75 to 1980-81
Labour	.77	.78	.74	.72	.76	.76
Capital	.46	.43	.46	.37	.47	.49
Land	.12	.23	.07	.24	.02	.14
T F I	1.35	1.44	1.27	1.33	1.25	1.50
T F P	.42	.17	.66	-.92	.08	2.40
Real Income	1.77	1.61	1.93	.41	1.33	3.90

Source : Table VI.5 and as per methodology discussed
in the text.

Table VI.7 : Relative Contribution of Various
Sources to the Growth Rate of
Output in the Primary Sector

(in percent)

Sources of growth / Output	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1967-68	1967-68 to 1974-75	1974-75 to 1980-81
Labour	43.50	48.45	38.34	175.61	57.14	22.31
Capital	25.99	26.71	23.83	90.24	35.34	12.56
Land	6.78	14.28	3.63	58.54	1.50	3.59
T F I	76.27	89.44	65.80	324.39	93.98	38.46
T F P	23.73	10.56	34.20	-224.39	6.02	61.54
Real Income	100.00	100.00	100.00	100.00	100.00	100.00

Source : Table VI.6.

During the reference period i.e. 1960-61 to
1980-81 TFI has grown at an average compound rate
of 1.35 per cent per annum (Table VI.5). Growth
rate of TFI has, however, declined during the latter
decade i.e. 1970-71 to 1980-81 compared to the earlier
one (Table VI.6). Breaking the period of two decades
into three sub-periods with break in points at 1967-
68 and 1974-75, it becomes obvious that growth rate
of TFI has been fluctuating. It declined from 1.33
per cent per annum during 1960-61 to 1967-68, to 1.25
per cent per annum during 1967-68 to 1974-75 and in-
creased again in 1974-75 to 1980-81, exceeding even
the rate experienced during 1960-61 to 1967-68.
Changes in the rates of growth of labour, capital and
land and in their relative shares, seem to be the
factors responsible for this fluctuation.

Growth rate of TFI in this sector lies in close
vicinity to the growth rate of labour input, reflec-
ting the labour absorbing nature of the sector.

Analysis of the rate of growth of real income
shows that over the reference period 1960-61 to 1980-
81, TFI contributed more than three-fourth of the
growth of output. A little less than quarter of the

growth came from TFP. As expected, labour turned out
to be the largest contributor both in absolute and
in relative terms. Capital was the second important
source of growth after labour and contributed slightly
more than one-fourths of the growth of output. Land's
contribution seemed to be the smallest being 6.78 per
cent only.

Decadal experiences show that there has been a
significant decline in the absolute and relative con-
tributions of TFI and significant increase in the
absolute and relative contributions of TFP during
1970-71 to 1980-81 as compared to the earlier decade
i.e. 1960-61 to 1970-71. Relative importance of indi-
vidual components of TFI to the growth rate of output
remained largely the same during the two decades with
labour contributing the largest part, followed by
capital and land. But, relative contribution of each
of these sources has declined during the latter decade
compared to the former. It can be seen from Table VI.6
that except capital, absolute contributions of other
two inputs i.e. labour and land are lower in the
latter decade in comparison to the former.

The decade 1970-71 to 1980-81, therefore shows
signs of some improvements in the performance of the
primary sector. However, the pattern of growth is
brought out more vividly by studying behaviour of
output, inputs, and total factor productivity during
three sub-periods, 1960-61 to 1967-68; 1967-68 to
1974-75 and 1974-75 to 1980-81.

During 1960-61 to 1967-68 largest and smallest
contribution came from labour and land respectively.
Growth rate of TFI exceeded the growth rate of output
and TFP made a negative contribution (Table VI.6 and
VI.7). During 1967-68 to 1974-75 absolute contribu-
tions of labour and capital increased relative to the
period 1960-61 to 1967-68, while that of land declined.
TFP made positive but a small contribution to the
growth of output.

A perceptible change, however, seems to have
occured during 1974-75 to 1980-81. Absolute contribu-
tions of all the inputs (except labour) increased
during this period in comparison to the earlier period
i.e. 1967-68 to 1974-75. During this period TFP made
a larger contribution than that the contribution of
TFI.

It may be pertinent to note here that total
factor productivity in the primary sector is determi-
ned largely by the magnitude and direction of total
factor productivity in the agricultural sector. It
is also widely known that productivity in the agricul-
tural sector besides stemming from such sources as
increased application of new and improved seeds, use
of chemical fertilisers, changes in cropping pattern
and cropping intensity is greatly conditioned by
natural factors like droughts, floods, crop damages
due to pests etc. And it is only when the production
structure develops enough strength to over-power the
random disturbances caused by the natural phenomena
that a steady rate of increase in output is possible.[28]
The built-in-resistance in the production structure
to off-set the random disturbances is of course brought
about, by making appropriate changes in the factor in-
puts, e.g. by investing in irrigation facilities,
assured and regular water supply can be obtained, and
production can be made less vulnerable to droughts;

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[28]S.K. Mukhopadhyaya, Sources of Variation in
Agricultural Productivity, The Macmillan Company of
India Limited, 1976, p.56.

by adequate flood prevention measures, danger of
floods can be averted; necessary provision for in-
secticides and pesticides, can provide protection
against pests and insects. Similarly, knowledge
about changes in cropping pattern in favour of agro-
climatic conditions and increased cropping intensity
if properly utilised can render output less sensitive
to random fluctuations. But for all this to happen
it is necessary that[29] farmers.___

    i.   possess adequate knowledge about improved
        seeds, chemical fertilisers and new farm
        practices along with the knowledge of
        costs, yields and returns associated with
        these inputs.

    ii.   are ready to undertake the risk and un-
        certainity attached to switching over
        from long established traditional prac-
        tices to newer ones.

    iii.   have the ability to make the necessary
        investment required for this purpose
        either from borrowings or from their
        own resources. It is only when all these
        conditions are met that changes in cropping
        intensity and cropping pattern occur which
        in turn provide growth and stability to
        agricultural production.

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[29]Biplab Das Gupta, The New Agrarian Technology,
The Macmillan Company India Limited, 1980, pp.239-256.

The limited change in cropping pattern that has taken place during 1965-66 the year when the bio-chemical technology was introduced in the State showed that the scope for introducing any change in the technology was limited by the subsistence nature of the farm economy.[30]   Among the various factors which affected this inducement was the important role played by the knowledge factor. Studies[31] have found that during the initial stage of introduction of HYV the knowledge of improved seeds and related inputs was not properly circulated among the farmers. Only a group of affluent farmers had access to this knowledge. Majority of the small farmers neither had any knowledge of the new technology nor of the various sources from where they could raise finances to undertake the investment required for this purpose. Gradually as the knowledge of the new technology was absorbed by the farmers their response to it increased, reflecting itself in changes in cropping pattern, changes in gross

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[30] P.D. Shrimali, Industrial Development and Industrial Relations in Uttar Pradesh in the Economic Backwardness of Uttar Pradesh, Papers read at the Seminar, Nov. 27-28, 1971, p. 102.

[31] S.M. Hall, Barriers to Free Choices in Development, 1973 (types) referred in Biplab Das Gupta, op. cit, pp. 241-242.

irrigated area as percentage to gross cropped area,
use of chemical fertilisers etc. (see Tables VI.8 and
VI.9). These changes were more pronounced during the
period 1974-75 to 1980-81 due to which contribution
of TFP works out to be much higher during this period
in comparison to the earlier periods i.e. 1960-61 to
1967-68 and 1967-68 to 1974-75.

Table VI.8 :   Growth of Some Relevant
              Indicators in U.P.

Period	Index of cropping intensity	Index of percentage of gross irrigated agea to gross cropped area	Index of use of chemical fertilisers
1960-61 to 1967-68	100.00	100.00	100.00
1967-68 to 1974-75	102.47	142.43	245.75
1974-75 to 1980-81	105.32	174.38	783.33

Source :   Agricultural Statistics in U.P., Directorate
           of Agriculture, Govt. of U.P., Various Issues.

Table VI.9 :   Percentage Area under High
              Yielding Varieties to Total
              Area under Respective Crops
              in U.P.

Years	Paddy	Wheat	Maize	Jowar	Bajra
1968-69	7.77	26.80	5.96	0.97	0.95
1974-75	32.20	67.41	1.45	-	4.50
1977-78	44.57	81.15	2.68	4.30	12.53

Source : A Fact Book on Agricultural Production, Steering
         Group on Agriculture, State Planning Commission,
         Uttar Pradesh, Lucknow, January 1980, p.36.

Table VI.8 and Table VI.9 show that but for irri-
gation, for all other indicators growth has been very
fast during 1974-75 to 1980-81. Thus total factor pro-
ductivity which acted as a negative source of growth
during 1960-61 to 1967-68 turned out to be a positive
contributor during 1967-68 to 1974-75. It became the
chief contributor during 1974-75 to 1980-81 and pushed
up the rate of growth of output to a level which is
substantially higher compared to the rate of growth
obtained during the two earlier periods.

2.2.2 <u>Secondary Sector</u> : Table VI.10 presents avera-
ge compound growth rates of inputs and output in the
secondary sector of the State. Absolute and relative
contributions of sources of growth to the growth rate
of sectoral output have been presented in Tables VI.11
and VI.12 respectively.

<u>Table VI.10</u> : Average Compound Growth Rates
of Inputs and Output : Secondary
Sector

Sl. No.	Inputs / Outputs	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1967-68	1967-68 to 1974-75	1974-75 to 1980-81
1.	Labour	1.85	- .90	4.67	- .90	2.26	4.65
2.	Capital	9.46	13.15	5.87	13.46	8.52	5.99
3.	T F I	4.59	3.92	5.26	4.73	3.85	5.26
4.	Output	5.78	6.14	5.43	4.48	4.25	9.16

Source : Row No. (1) Table IV.11.

(2) Table V.6.

(3) Appendix Table F.1.

(4) Table II.3.

Table VI.11 : Absolute Contribution of Various
Sources to the Growth rate of Real
Output in the Secondary Sector

Sources of growth	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1967-68	1967-68 to 1974-75	1974-75 to 1980-81
Output				(in percentage points)		
Labour	2.22	.25	3.91	1.19	1.74	3.90
Capital	2.37	3.67	1.35	3.54	2.11	1.36
T F I	4.59	3.92	5.26	4.73	3.85	5.26
T F P	1.19	2.22	.17	- .25	.40	3.90
Output	5.78	6.14	5.43	4.48	4.25	9.16

Source : Table VI.10 and the methodology discussed in the
text earlier.

Table VI.12 : Relative Contribution of Various
Sources to the Growth Rate of Real
Output : Secondary Sector

(in percent)

Sources of growth	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1967-68	1967-68 to 1974-75	1974-75 to 1980-81
Output						
Labour	38.41	4.70	72.00	26.56	40.94	42.58
Capital	41.00	59.77	24.86	79.02	49.65	14.85
T F I	79.41	63.84	96.86	105.58	90.59	57.42
T F P	20.59	36.16	3.14	-5.58	9.41	42.58
Output	100.00	100.00	100.00	100.00	100.00	100.00

Source : Table VI.11.

It is evident from Table VI.10 that TFI in the secondary sector has grown at an average compound rate of 4.59 per cent per annum. It has however grown more fast during seventies as compared to sixties owing to the fast increase in labour input during the latter decade which seems to have offset the sharp decline in the rate of growth of capital input during the same period. Table also shows that after having declined during 1967-68 to 1974-75, TFI has again increased sharper during next six years. 1974-75 to 1980-81. Changes in the growth rates of labour and capital, account for such behaviour.

Table VI.11 shows that the decade 1960-61 to 1980-81 about fourth-fifth of the growth of real output came from increase in the quantities of labour and capital leaving about one-fifth as the contribution technological change or productivity growth. It is striking to note however that, the relative contribution of TFP (as well as its absolute contribution) declined sharp during seventies compared to the earlier decade. Labour's contribution has increased greatly and that of capital reduced to more than half in seventies, compared to the decade 1960-61 to 1970-71. While during

1960-61 to 1970-71, capital turned out to be the chief contributor to the growth of output, the place was taken away by labour during seventies.

Three period division of the reference period (1960-61 to 1980-81) brings out the pattern of growth of input, output and TFP in this sector more clearly.

During 1960-61 to 1967-68, the contribution of capital was about three times that of labour. TFI grew faster than real output, TFP played a negative role.

The period from 1967-68 to 1974-75 showed improvement in the situation. During this period TFP made a positive though very small contribution to growth of income in the secondary sector. About 50 per cent of growth during this period came from capital input. Relative contribution of labour worked out to be 40.94 per cent which is much higher compared to its contribution during 1960-61 to 1967-68.

The period from 1974-75 to 1980-81 showed a completely changed scene in comparison to the other two phases of economic growth. This period experienced a

moderate increase in the contribution of labour, a
sharp decrease in the contribution of capital and
fast increase in TFP, compared to the earlier period
1967-68 to 1974-75.

An insight into the structure of the secondary
sector reveals that, the two major components of this
sector viz. household manufacturing and construction
are highly labour intensive. The household manufac-
turing sector utilises only small quantity of capital
and production in this sector is carried out using
traditional methods. While the sector has its own
importance regarding promotion of income and employ-
ment, it can not be expected to act as a leading sector
for increasing productivity in the secondary sector.
It is the large scale manufacturing sector, which by
better use of labour and capital resources and changes
in technology, can accelerate the pace of productivity.
And it is this sector that has lagged behind during
during 1960-61 to 1967-68[32] explains, why TFP growth

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[32]During this period the two important industries
namely sugar and textiles which accounted for bulk of
the labour employed, in this sector were in bad shape.
These industries had old and worrout machinery that
needed replacement and modernisation. See, (i) Techno-
Economic Survey of U.P., National Council of Applied
Economics Research, 1965, pp.107-109.

acted as a negative source of growth during this
period.

The improvement in the situation during 1967-68
to 1974-75 is explained by changes in the structure
of the manufacturing industries. During this period,
the structure turned more in favour of industries
producing capital goods and chemical products, using
modern technology.[33] This appears to be one of the
reasons that changed negative contribution of TFP
during 1960-61 to 1967-68 into a positive contribution
during 1967-68 to 1974-75.

It is to be noted that the positive though small
contribution of TFP during this period is accompanied
by a sharp increase in the contribution of labour and
a decline in the contribution of capital in comparison
to the period 1960-61 to 1967-68. Thus, while capital

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[32]Contd...
    ii) P.D. Shrimali, "Industrial Development and
Industrial Relations in Uttar Pradesh" in Economic
Backwardness of Uttar Pradesh, paper read at the
seminar, Nov.27-28, 1971, p.93.
    iii) Kripa Shankar, "Economic Development of
Uttar Pradesh, Allahabad Arthik, 1970.

[33]T.S. Papola, "Spatial Diversification of Manu-
facturing Industries" in Studies on Development of
Uttar Pradesh, Papola and others (eds.), Giri Institute
of Development Studies, Lucknow pp.176-221.

still occupied the highest rank among the sources of
growth in this sector, its importance with respect
to labour declined as compared with the earlier period.
The increase in labour input during this period both
in factory establishments and in the household sector,
causing a decline in capital input per unit of labour,
perhaps resulted in better utilisation of capital in-
put and thereby resulting in a positive contribution
of TFP.

Similarly increase in the relative contribution
of TFP during 1974-75 to 1980-81 accompanied by decline
in relative contribution of capital, when viewed in
the light of variations in the rates of growth of
these two inputs over-time suggest, that during this
period increasing labour input has cooperated with
slowly increasing capital goods containing new techno-
logy in a better way compared to the earlier periods.
In fact it implies that labour has become more effi-
cient and has adjusted itself with changing technology.

2.2.3 <u>Tertiary Sector</u> : The tertiary or the service
sector provides the infrastructure for the development
of the commodity producing sectors of the economy.

While growth of this sector depends on the growth of
the commodity producing sectors of the economy, a weak
tertiary sector can also act as an impediment for the
future growth of the commodity producing sectors and
thus for the growth of the economy. For analysing the
main sources of growth in the tertiary sector average
compound growth rates of inputs and outputs have
been presented in Table VI.13.

Table VI.13 : Average Growth Rates of Inputs
and Output Tertiary Sector

Inputs / Outputs	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1967-68	1967-68 to 1974-75	1974-75 to 1980-81
1. Labour	1.05	.16	1.95	.16	1.14	1.99
2. Capital	3.72	3.79	3.64	3.67	3.80	3.68
3. T F I	1.82	1.02	2.62	1.09	1.72	2.79
4. Output	3.30	3.20	3.40	2.41	3.16	4.52

Source : Row No. (1) Table IV.4.
(2) Table V.5.
(3) Appendix Table F.1.
(4) Table II.3.

It is observed that during the period of two deca-
des 1960-61 to 1980-81 TFI in this sector has increased
at an average rate of 1.82 per cent per annum. Rate of
growth of TFI is much faster in the latter decade compared

to the former decade. In fact growth rate of TFI re-
vealed from the table (VI.13) that increasing rate of labour
input has been the major factor for pushing up the rate
of growth of TFI during all the periods. Contributions
of different sources to the growth rate of sectoral
output have been presented in Tables VI.14 and VI.15.

Table VI.14 : Absolute Contribution of Various
Sources to the Growth Rate of
Output in the Tertiary Sector

(Percentage Points)

Growth Sources / Output	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1967-68	1967-68 to 1974-75	1974-75 to 1980-81
Labour	.91	.10	1.72	.14	.89	1.83
Capital	.91	.92	.90	.95	.83	.96
T F I	1.82	1.02	2.62	1.09	1.72	2.79
T F P	1.48	2.18	.78	1.32	1.44	1.73
Output	3.30	3.20	3.40	2.41	3.16	4.52

Source : Table VI.13.

Table VI.15 : Relative Contribution of Various
Sources to the Growth Rate of
Output : Tertiary Sector

(in percent).

Sources of growth / Output	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1967-68	1967-68 to 1974-75	1974-75 to 1980-81
Labour	27.58	3.13	50.59	5.81	28.16	40.41
Capital	27.58	28.75	26.47	39.42	26.27	21.24
T F I	55.16	31.88	77.06	45.23	54.43	61.73
T F P	44.84	68.12	23.94	54.77	45.51	38.28
Output	100.00	100.00	100.00	100.00	100.00	100.00

Source : Table VI.14.

During the reference period of two decades, both
labour and capital have contributed equally to the growth
of output in the tertiary sector (Table VI.14).   Together
they made 55.16 per cent contribution, remaining 44.84
being contributed by technological change.   Inter tem-
poral comparison over the two decades shows (Table
VI.15) that relative contribution of labour input has
declined.   This trend is accompanied by the declining
trend in the relative contribution of technical change
through time. Looking back at Table VI.13 it can be

easily seen that decline in the growth rate of capital input and fast increase in the rate of growth of labour input is the main factor behind this trend.

Studying the contributions of sources of growth during three sub-periods viz., 1950-61 to 1967-68, 1967-68 to 1974-75 and 1974-75 to 1980-81; it is found that conclusions remain broadly the same as above i.e. relative contribution of labour input has increased through time and that of capital, and technical change have declined. Thus failure to provide more capital per worker has been the major factor causing decline in the contribution of technological change or productivity growth in this sector.

2.3 Analysis of Sources of Growth - Embodied Technical Change

The analysis in the preceding section assumed technical change to be purely disembodied i.e., technology grows through time and enables same amount of labour and capital to produce more output. However, technical change is not purely disembodied; a part of it is embodied in labour and capital.[34]

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[34] A. Heertje, op. cit, p.174.

While many theoretical models have been developed
to account for the technical change,[35] working with
embodied change is quite a cumbersome procedure espe-
cially for capital. During the process of growth more
productive capital goods embodying latest technology are
brought into the productive system. This improves
average quality of the capital stock, depending upon its
age structure (which depends itself on the rate at
which new capital goods are brought into the system)
and the rate at which technical progress improves the
quality of the new capital goods. Since latter is one
of the unknowns, empirical studies depend on trial and
error methods to obtain the rate of embodied technical
progress which gives the best fit for the function to
be estimated.[36] To avoid these problems, capital here
has been measured net at constant prices and the effect
of changes in the productivity of capital are assumed
to be reflected in the measure of the residual.

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[35] R. Solow was the first economist to incorporate
Technical change in the Cobb-Douglas Production Function.
See, R.M. Solow, "Investment and Technical Progress" in
Mathematical Methods in Social Sciences, K. Arrow, S.
Karlin and P. Suppes (eds.), Stanford University Press,
1960, pp. 89-104.

[36] A.P. Thirlwal, Growth and Development, op. cit,
pp. 70-71.

An attempt has, however, been made to account for the technical change embodied in labour input. The average quality of labour is greatly effected by changes in the educational level of the work force and changes in its sex-composition.[37] The index of labour input duly adjusted for these qualities was prepared in Chapter IV (Table IV.21). Due to non availability of sector-wise education income differentials, the quality adjustment could be made only on aggregative basis. Hence embodied analysis of sources of growth has also been undertaken on the aggregative basis. Total factor input obtained by combining quality adjusted index of labour input with capital and land inputs (using factor share as weights) has been presented in Table VI.16. Average compound growth rates of total factor input (quality adjusted) along with growth rates of its different components have been presented in Table VI.17.

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[37] This is not of course the exhaustive list of all the factors that affect the quality of labour input in any economy during a period of time. Besides these, there are a host of other factors like changes in the health level of the work force, changes in the occupational shifts, changes in the length of hour worked etc. which effect the quality of labour input.

Table VI.16 : Total Factor Input (Adjusted)
and Its Main Components

Years	Labour (quality adjusted)	Capital	Land	T F I
0	1	2	3	4
1960-61	100.00	100.00	100.00	100.00
1961-62	102.41	103.58	100.47	102.92
1962-63	105.51	106.07	100.41	104.64
1963-64	107.54	114.35	100.52	107.39
1964-65	110.16	121.07	104.35	110.96
1965-66	112.89	127.36	105.04	113.65
1966-67	115.67	131.62	105.17	116.08
1967-68	118.52	137.90	105.54	118.98
1968-69	121.44	145.30	104.47	121.78
1969-70	124.43	153.18	104.49	124.95
1970-71	127.03	162.14	104.68	128.19
1971-72	129.73	168.42	104.91	130.96
1972-73	132.74	174.79	104.37	133.79
1973-74	135.82	180.93	104.14	136.67
1974-75	138.71	188.66	104.62	139.23
1975-76	141.66	198.69	104.61	140.50
1976-77	144.68	204.91	105.22	149.74
1977-78	147.78	213.77	105.57	153.49
1978-79	150.97	224.26	106.05	157.63
1979-80	154.12	229.52	106.05	160.68
1980-81	159.93	238.70	105.93	166.18

Source : Col.(1) IV.21; Col.(2) Table V.5; Col.(3)Appn.
Table E.1; Col.(4) as described in the text.

Table VI.17 :   Average Compound Growth Rates
of Inputs and Output

Inputs/outputs	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81
1. Employment	1.33	.95	1.71
2. Quality of labour due to education and sex-composition changes	1.03	1.45	.61
3. Labour input	2.38	2.42	2.33
4. Capital	4.45	4.95	3.94
5. Land	.29	.46	.12
6. T F I (adjusted)	2.57	2.51	2.63
7. Output	2.71	2.54	2.88

Source :   Tables VI.2, VI.5 and IV.21.

It is evident that except employment, growth rates
of all other inputs have declined during the decade
1970-71 to 1980-81 as compared to the decade 1960-61 to
1970-71 (Table VI.6).   It is interesting to note, how-
ever, thatdespite lower growth rates, TFI during the
latter decade has grown much faster compared to its
growth during the earlier decade. Thus the increase in
the rate of employment and increase in the percentage

shares of both labour and capital during the end of
seventies, seem to have more than offset the effect of
decline in growth rates of inputs. Absolute and
Relative contributions of sources of growth to the
growth rate of output have been presented in Table
VI.18.

Table VI.18 : Contributions of Different
Sources to the Growth Rate
of Output

Sources of growth / Output	Absolute Contribution			Relative Contribution		
	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81
1. Employment	.99	.64	1.36	36.53	25.20	47.22
2. Quality of labour due to increased education and changing sex-composition	.64	.88	.38	21.07	34.65	13.19
3. Labour (1+2)	1.63	1.52	1.74	60.15	59.85	60.42
4. Capital	.85	.87	.80	31.37	34.66	27.77
5. Land	.09	.12	.09	3.32	4.72	3.13
6. T F I (adjusted)	2.57	2.51	2.63	94.84	98.82	91.32
7. T F P	.14	.03	.25	5.16	1.18	8.68
8. Output	2.71	2.54	2.88	100.00	100.00	100.00

Source : Table VI.17.

Adjustment for quality of labour shows, that during the two decades i.e. 1960-61 to 1980-81 as well as during each of the decade, both in absolute and in relative terms, highest contribution came from labour input. Over the two decades 1960-61 to 1980-81, quantity and quality of labour input is found to have contributed 60.15 per cent of the growth of output. Quality of labour has made a contribution of 23.62 per cent towards the output growth. It is of concern however, that both in absolute and in relative terms contribution of quality has reduced during seventies as compared to sixties; although its reduced effect has been offset by the faster growth in employment during 1970-71 to 1980-81 as compared to the earlier decade.[38]

Accounting for labour embodied technical change has reduced the relative contribution of TFP from 28.42 per cent (Table VI.3) to 5.16 per cent. This shows 82.05

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[38]Despite the decline in the relative contribution of labour quality during 1970-71 to 1980-81 as compared to 1960-61 to 1970-71, relative contribution of labour input (adjusted for quality change has not declined during the latter decade as compared to the earlier) implying that reduced effect of labour quality has been more than made up by the faster growth of labour quantity.

per cent of technical change during 1960-61 to 1980-81
was labour embodied, remaining 17.95 per cent was either
embodied in capital or acted in a disembodied way.
During 1960-61 to 1970-71, 96.70 per cent of the techni-
cal change was labour embodied while in the latter
decade this percentage reduced to 60.32 only i.e. 39.68
per cent of technical change during 1970-71 to 1980-81
was either embodied in capital or acted in a disembodied
way coming from such sources as changes in resource-
shifts, economies of scale, changes in the form of busi-
ness organisation, advances in knowledge etc.

2.4 Conclusions

Main conclusions emerging from the analysis in this
chapter can now be summarised as:

1. During the two decades 1960-61 to 1980-81 tradi-
tionally measured inputs contributed a substantial part
(71.59 per cent) of the growth of real income in the eco-
nomy.

2. During twenty years considered, increase in the
quantity of labour has made the largest contribution
to the growth of real output in the economy. Contribu-
tions of capital and land come next in sequence.

3.   Over the two decades 1960-61 to 1980-81 total factor productivity or technological progress has grown at an average compound rate of 0.77 per cent per annum contributing 28.41 per cent of the growth of real output in the economy.

4.   The rate of technological progress has declined during seventies as compared to sixties. However adoption of a three period division of the period (1960-61 to 1980-81), according to different phases of growth observed in the economy reveals that although technological progress grew at a negative rate during the early phase, its rate has improved since 1967-68 and has been significantly faster during latter part of seventies, 1974-75 to 1980-81.

5.   Decadal comprasion reveals improvement in the rate of growth of total factor productivity in the primary sector during seventies as compared to sixties. Reverse to this, however, happened in the tertiary and secondary sectors.

6.   Both primary and the secondary sectors, reveal negative contribution of technological change during

the initial phase 1960-61 to 1967-68, and faster growth during 1974-75 to 1980-81. However, technological progress has been faster in the primary sector than in the secondary.

7. In the tertiary sector although rate of technological progress shows constant improvement, its relative contribution is found to have declined during latter periods i.e. 1967-68 to 1974-75 and 1974-75 to 1980-81 compared to the early phase 1960-61 to 1967-68.

8. Intra sectoral comparison of inputs and output for the three period division of the study period, suggests that variation in rates of growth of inputs have resulted in changes in their combined efficiency.

9. Analysis with embodied technical change, with improvements in the quality of labour due to increased education and changing sex-composition of the work force, counted with growth in factor quantities, reveals that :

    i. Over the two decades considered as a whole, 23.62 per cent of the growth real income represents contribution of labour quality.

ii. Absolute and relative contributions
of labour quality have declined during
seventies as compared to sixties,
though this declining effect is found
to have been compensated by the growth
of employment, so that contribution of
labour does not decline but shows a
marginal increase in seventies as compared
to sixties.

Table F.1 : Indices of Total Factor Input
in the Three Sectors

Years	Primary sector	Secondary sector	Tertiary sector
1960-61	100.00	100.00	100.00
1961-62	100.42	100.42	101.01
1962-63	102.91	102.91	102.09
1963-64	109.09	109.09	103.20
1964-65	113.92	113.92	104.40
1965-66	129.78	129.78	105.33
1966-67	133.92	133.92	106.58
1967-68	138.23	138.23	107.90
1968-69	147.00	147.00	109.31
1969-70	155.66	155.66	110.78
1970-71	146.91	146.91	110.70
1971-72	155.76	155.76	113.31
1972-73	163.79	163.79	115.94
1973-74	170.90	170.90	118.74
1974-75	180.03	180.03	121.55
1975-76	188.35	188.35	126.32
1976-77	199.57	199.57	129.44
1977-78	211.20	211.20	132.98
1978-79	224.81	224.81	135.98
1979-80	234.53	234.53	139.37
1980-81	245.32	245.32	143.37

Source : As per methodology discussed in the text
for preparing TFI index for the aggregate
economy.

Chapter VII

CONCLUSIONS

The present chapter recapitulates main findings
of the exercise on measurement of the sources of
growth of the economy of Uttar Pradesh contained in
the previous chapters; and attempts to bring out
implications of these findings for the pattern of
growth and resource-use-efficiency in the growth
process of the State.

For the purpose of analysis two alternative
periodisations were adopted. First, a decadal
compraison was undertaken. Second, the analysis
was undertaken by dividing the study period into
three parts 1960-61 to 1967-68; 1967-68 to 1974-75
and 1974-75 to 1980-81. The latter periodisation
highlighted three different phases of growth of
the economy — (i) very slow growth, (ii)
fluctuating but moderately high growth, (iii) high
and stable growth; and seemed to correspond to
some major changes occuring in the economy such as
the introduction of new agricultural technology in

1966 and significantly high and stable growth recorded
by all the three broad sectors in the economy viz,
primary, secondary and tertiary since the mid seven-
ties. The analysis based on this periodisation,
therefore, appeared more appropriate for drawing impli-
cation of the findings of the study.

1. Growth of Real Income

(i) During the twenty years period 1960-61 to
1980-81, the real aggregate income of the economy of
Uttar Pradesh has grown at a rate of 2.71 per cent
per annum. It has, however, experienced varying growth
rates during different parts of this period. If the
two decades covered in the study are considered
separately, it is found that the decade 1960-61 to
1970-71 experienced a growth rate of 2.54 per cent per
annum and the next decade, 1970-71 to 1980-81, of 2.88
per cent per annum.

(ii) On a closer look one finds three distinct
phases in the entire period. During the period 1960-61
to 1967-68 the State economy experienced a very slow
growth rate. There was a gradual improvement in the
next seven years. But, a real break-through seems to

have taken place during 1974-75 to 1980-81. This
period experienced a rate of growth of 4.97 per cent
as compared to 2.19 per cent during 1960-61 to 1967-68
and 1.34 per cent during 1967-68 to 1974-75.

2. Sectoral Growth

(i) During the entire period of the two decades,
the primary, secondary and tertiary sectors expe-
rienced growth at average annual compound rates of
1.77, 5.78 and 3.30 per cent respectively. While both
primary and the tertiary sectors, improved their growth
rates during 1970-71 to 1980-81 in comparison to the
earlier decade i.e. 1960-61 to 1970-71, growth rate
deteriorated in the secondary sector.

(ii) All along the twenty years, average growth
rate of the State economy has remained dominated by
the growth in the primary sector, due obviously for
the fact that this sector contributes largest share of
the State income. Almost stagnant primary sector,
resulted in the sluggish growth of the State economy
during 1960-61 to 1967-68. Improved performance of the
primary sector after 1967-68 and especially after

1974-75 is reflected in the better performance of the
State economy during these periods.

3. Income Structure

During 1970-71 to 1980-81, the economy has ex-
perienced a gradual shift in the sectoral incomes with
percentage share of the primary sector declining by
4.99 per centage points as compared to its percentage
share during 1960-61 to 1970-71. While a gradual
decline in the percentage share of the primary sector
is a natural corollary of development, the fact that
this has gone in favour of the tertiary sector, instead
of secondary has some serious implications for the
economy. Increase in the percentage share of the
service sector, consequent upon the decline in the
share of the commodity producing sector (primary and
secondary) is likely to have added to the inflationary
pressure in the economy.

4. Functional Classification of Income

The exercise on functional break-down of State
income among the primary factors — land, labour and
capital has some interesting findings to offer.

(i) There has been no substantial change in the percentage share of labour over the period of twenty years, confirming the hypothesis of 'constant labour share' for the State economy.

(ii) Percentage share of capital shows a mildly increasing trend and that of land a correspondingly declining one, suggesting that the nature of technical change has been land augmenting.

(iii) The functional distribution of State income by sectors, shows that by and large, all the three sectors viz. primary, secondary and tertiary support the constant labour share hypothesis. However, secondary and the tertiary sectors, reveal a mildly increasing trend in the percentage share of labour, which is more pronounced in the secondary sector than in the tertiary sector. In the case of the primary sector, percentage share of labour has been almost static.

(iv) Share of labour, in the income of the primary sector is relatively small, in comparison to its share in the secondary and tertiary sectors. This, when viewed in the light of the fact that primary sector accounts for the largest percentage of total employment,

reflects the low level of productivity of labour in this sector. A gradual decline, which the primary sector has undergone in terms of its percentage share of employment, therefore portends an encouraging sign.

5. Labour Input

(i) Labour input in the State economy measured as the increase in the working force, registered a growth of 30.34 percentage during the study period, growing annually at an average compound rate of 1.33 per cent.

(ii) Of the two components of labour input — males and females, the latter showed a decline during the two decades, and thus checked a faster growth of labour input in the economy. It is important to note however, that sex-composition of the work force which moved against females during 1960-61 to 1970-71 has taken a positive turn in their favour during 1970-71 to 1980-81. Female labour input which during sixties grew at a rate of -3.18 per cent per annum, recorded a positive growth of .13 per cent per annum during the seventies. Consequently, growth in labour input has been faster during the latter decade as compared to the earlier one.

(iii) The sectoral composition of labour input revealed a moderate shift away from the primary sector in favour of secondary and the tertiary sectors. But that a part of this shift has gone in favour of the tertiary sector, indicates failure of the secondary sector to provide increased opportunities for employment. It is, however, noted that while during 1960-61 to 1970-71 fastest growth in labour input occured in the primary sector; during seventies, fastest growth has been recorded in the secondary sector.

(iv) During the study period of two decades quality of labour input measured in terms education and sex-composition of the work force has increased at a rate of 1.03 per cent per annum. Rate of growth of quality change has however declined during seventies compared to the period 1960-61 to 1970-71. If we add qualitative changes to the quantitative increase, growth of labour input during the period of two decades has been of the order of 59.93 per cent. Thus 43.88 per cent of the measured growth of labour input is accounted for by the effect of qualitative changes in labour input. However, importance of these factors in raising the growth of labour input has decreased with time as revealed by its decreasing effect during seventies.

6. Capital Input

(i) Capital experienced the fastest growth among inputs during the study period 1960-61 to 1980-81. Measured at constant 1970-71 prices, it increased at a rate of 4.45 per cent per annum. Its rate of growth declined during the latter decade in comparison to the earlier one.

(ii) Capital input in the three sectors primary, secondary and tertiary grew at annual rates of 3.09, 9.45 and 3.72 per cent respectively. In all the three sectors growth of capital input declined during 1970-71 to 1980-81 in comparison to 1960-61 to 1970-71. A noticeable feature of the growth of capital input has been that, while during the first half of the study period highest growth of capital input occured in the secondary sector, this sector also stood first in terms of decline in growth rates of capital input during the latter decade.

(iii) In terms of its sectoral composition, secondary sector had the smallest percentage of total capital input during the entire period of twenty years under reference. 93 per cent of the total capital input

during 1960-61 to 1980-81 represented shares of primary
and the tertiary sectors, both sharing almost equally.
However, secondary sector improved its percentage share
in the total capital input during seventies, sharing
about one-fourth of the total capital input used in
production in the economy, compared to a 6 per cent share
during sixties. Percentage shares of the primary and
tertiary sectors declined during 1970-71 to 1980-81.
While during sixties the tertiary sector accounted for
the largest percentage in capital input, during seventies
it was the primary sector which acquired the largest
share. These changes in percentage share of the
sectors in total capital input, reflect the importance
placed on growth of these sectors during different
plans. Larger shares of the tertiary and primary
sectors during 1960-61 to 1970-71, show the importance
placed on the development of infrastructure and agricul-
ture. Growing share of the secondary sector reflects
a shift from agriculture and infrastructure to the
development of industrial sector in the latter years.

7. Land Input

(i) During 1960-61 to 1980-81, land input in the
economy shows a marginal growth of 0.29 per cent per
annum. Rate of growth during seventies is lower compared
to sixties. Decline in the rate of growth of land input
with time suggest that the possibilities of increasing
land, one of the basic input for production, are
becoming increasingly limited.

8. Total Factor Input

(i) Over the period of two decades 1960-61 to
1980-81, combined input of land, labour and capital or
the total factor input has grown at a rate of 1.94 per
cent per annum. The growth rate has accelerated with
time being higher in the latter decade compared to the
earlier. Labour input has been the dominant component
of this growth, all along the twenty years period.
When qualitative improvements are also counted as a
part of growth in factor quantity, total factor input
registers a growth of 68.03 per cent or 2.47 per cent
per annum.

(ii) Pattern of growth of total factor inputs,
however, varied among sectors. While total factor
input has been increasing in all the three sectors,
in case of the primary sector, its rate of growth has
been slower during 1970-71 to 1980-81 as compared to
1960-61 to 1970-71, while both in the secondary and
the tertiary sectors, total factor input has grown
faster during seventies as compared to sixties.

9. Contributions of Sources of Growth

(i) During the entire period of two decades 1960-
61 to 1980-81 increase in the quantity of traditional
factor inputs, explains 71.59 per cent of the increase
in output. Most important source of growth has been
labour with an average contribution of 36.53 per cent.
Next important source has been capital with an average
contribution of 31.37 per cent. Importance of land
in contributing to the growth of the State economy has
turned out to be the lowest.

(ii.) When quality changes are also counted with
factor quantity, and are not assumed to be included
into the residual effect termed as technical change,

contribution of labour rises to 62.36 per cent and
that of technological change drops to 5.16 per cent.
23.62 per cent of the growth of output during 1960-61
to 1980-81, represents contribution of labour quality.

(iii) The relative importance of various sources
has, however, been different among the three sectors.
Labour has been the major source of growth in the primary
sector, and capital in the secondary sector. In the
tertiary sector both labour and capital are found to
have been equally important.

(iv) The study finds that over the period of two
decades the economy of Uttar Pradesh experienced dis-
embodied technological progress at a rate of 0.77 per
cent per annum., contributing 28.41 per cent of the
growth of real income in the economy. In comparison
to the rate of growth of capital (4.45 per cent) during
this period, the rate of technological progress is
obviously very slow, indicating the slow rate of obsorp-
tion of technology in the economy. A further decline
in this rate during seventies as compared to sixties
as revealed by decadal compraison, is all the more
disqueting.

(v) However, the rate of technological progress
and its relative contribution to the process of growth
of the economy is found to be continuously improving.
If we look at the trend by dividing the entire 20 years
period into three sub-periods as indicated earlier, it
is seen that from a negative rate of -.29 per cent
during the initial phase 1960-61 to 1967-68, the rate
of technological progress improved to .20 per cent
during the next phase 1967-68 to 1974-75 and jumped to
2.71 per cent during 1974-75 to 1980-81.

(vi) With the introduction of new agricultural
technology in 1966, a gradual improvement is seen to
have taken place in the productivity of the economy
after 1967-68. A faster growth of total factor produc-
tivity during latter seventies also seems quite
consistent with the available facts about more stable
and faster growth in agriculture and manufacturing
sectors resulting from (i) a wider application of new
agricultural technology, and (ii) changes in the
structure of manufacturing industries in favour of
capital goods producing industries. which are known
to be the carriers of technological change.

(vii) The pattern of negative technological progress during 1960-61 to 1967-68, a gradual improvement in it after 1967-68 and its relative faster growth during 1974-75 to 1980-81 are clearly observed for the primary and secondary sectors. The increase however, has been faster in the primary sector, so much so, that technical change is found to have made a greater contribution than increase in factor quantities in this sector, during 1974-75 to 1980-81. In the tertiary sector, however, relative contribution of technological change is found to have declines since 1967-68.

(viii) A general conclusion emerging from these trends is that the rate of growth of technological progress in the State economy has been determined by the productivity performance of its two broad sectors viz. primary and the secondary. Both primary and the secondary sector having revealed a negative rate of total factor productivity during 1960-61 to 1967-68, the technological progress was negative in the economy. With moderate growth of productivity revealed by these two sectors during 1967-68 to 1974-75, a gradual improvement towards a positive growth of total factor productivity occured in the aggregate also. With the two sectors

experiencing higher productivity growth during 1974-75 to 1980-81, technological progress turned out to be significantly higher in the economy.

(ix) The tertiary sector is found to have been relatively less important in influencing the rate of technological change in the economy. Despite higher productivity in this sector during 1960-61 to 1967-68, the rate of growth of total factor productivity in the economy turned out to be negative.

10. Conclusion

The above highlights of the study of the relative importance of various sources in the process of economic growth of the State economy bring out some interesting implications.

1. As could be expected, the study shows that during early stages of economic development technological change was a relatively less important source; its importance grew with the growth of the economy.

2. There seems to have occured a significant change in the efficiency of resource-use in the economy. Negative rate of technological change during 1960-61 to

1967-68 shows decline in the efficiency of resource-
use. This may be due to the fact that a part of the
resources were still in the process of being converted
into productive assets and were not fully utilised
during the period. Although large investments were
made in the development of infrastructure and various
projects in the initial phase, the quantity and quality
of labour input was probably inadequate to complement
these inputs. In the latter period, better utilisation
of created infrastructure, completion of development
projects such as irrigation and power and use of
necessary quantity and quality of labour input have
led to a rise in the efficiency of resource-use. This
change has resulted both in the higher rates of growth
of real income and a larger contribution of technological
change to the growth of output.

Increasing use of labour than of capital as a
source of higher productivity and growth, which is ob-
served in the aggregate is, however, not necessarily
true in each sector. In case of the tertiary sector,
increasing growth rate of labour accompanied by lower
rates of capital during 1974-75 to 1980-81, compared

to the earlier period i.e. 1967-68 to 1974-75, have reduced the relative contribution of technological change. Here, the increasing numbers, had to work with smaller amount of capital per head than before; thus reducing productivity. In the case of the primary sector, decline in the growth rate of both labour and capital and increase in the growth rate of land input during 1974-75 to 1980-81 in comparison to the rates experienced by these inputs during 1967-68 to 1974-75 have resulted in greater contribution of technological change, leading to higher growth of output.

In case of the secondary sector, increase in the rate of growth of labour and decreases in the rate of growth of capital during 1974-75 to 1980-81, compared to the earlier periods, are found to be associated with a relatively larger contribution of technological change. It shows in fact, that increasing labour has more efficiently combined with the capital, which has. though increased at a slower rate than in the earlier periods. Thus while during 1974-75 to 1980-81 both primary and the secondary sectors were able to raise growth and productivity by their efficient resources utilisation, the tertiary sector failed to do so.

3. Inter-sectoral productivity trends and re-
lated rates of labour input suggest that <u>structural
shift in employment</u> noticed during the latter seven-
ties has been an important source of increasing
efficiency of factor inputs in the primary and secondary
sectors which together have resulted in the increased
efficiency of factor inputs at the aggregate level,
even though, productivity declined in the tertiary
sector.

4. Changes in the rates of growth of labour and
capital inputs and associated direction of technical
change, suggests that the nature of technical change
experienced by the State economy has been capital
augmenting and labour intensive. In the primary
sector, where technical change is found to have occured
to a perceptible extent, it has been land augmenting
and capital and labour substituting. Thus, nature of
technical change is found to have been quite consistent
with the factor endowments of the labour abundant and
capital-land scarce economy.

5. The observed pattern of technical change and
the process of economic growth of the State over the

sub-periods seem to offer two alternative hypothesis.
First, faster growth of real income and productivity
experienced during the latter years are the outcome
of economies of large scale production obtained by use
of greater factor quantities. Alternatively, the move
towards optimal use of basic factor inputs by way of
factor substitution has tended to speed up the growth
of real income and productivity during the latter years.

The general evidence available about the size
structure of production units in the economy does not
lend much support to the 'economy of scale' hypothesis.
For, the production structure of the two broad sector
viz. agriculture and industry, which shape growth of
income and productivity in the economy have shown signs
of getting more and more decentralised with time. In
agriculture, operational holdings with less than one
hectare of cultivable area have increased by 12.6 per
cent during the two agricultural Censuses 1970-71 and
1975-76. During the same period large agricultural
holdings with 10 or more hectares of area declined by
23.2 per cent.[1] Similarly the production structure of

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[1] Uttar Pradesh Ki Arthik Sneeksha (Hindi),
Directorate of Economics and Statistics, State Planning
Institute, U.P, 1979-80, pp.25-26.

the manufacturing sector is getting more and more ...
dominated by small scale units. During 1960-61 to
1979-80, the number of small scale units registered
with Directorate of Industries increased from 3107
to 47943[2] i.e. 1443 per cent. During the same period
number of registered factories in the State increased
from 2599 in 1960-61 to 5540 in 1980-81[3] i.e. 113 per
cent. Average number of employment per factory for
large and medium scale units in the State has also
registered a declines from 407 to 315 during 1960-61
to 1980-81.[4]

Thus the average size of production units have
shown a declining tendency during the periods, which
goes to disfavour the hypothesis that improvement in
resource-use efficiency is attributable to the economies
of large scale production.

It, therefore, appears that complementarity of
factor inputs which seems to have moved towards opti-
mality has been the decisive factor for the magnitude

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[2]Five Year Plan, Draft Annual Plan 1981-82
(Review), U.P, Vol.II, p.86.

[3&4]Annual Survey of Industries, U.P, Directorate
of Economics and Statistics, State Planning Institute,
U.P.

and direction of technical change during the latter
years. The inefficient factor combination during
the earlier phase with more capital and less labour
in the aggregate and in their unfavourable combination
at the sectoral level, led to a low level of efficiency
of resource use.

However, in due course of time, experience and
expertise has improved[5] labour skill. Capital also
seems to have been modified to suit the existing re-
quirement. With these changes taking place factor in-
puts have turned out more complementary to each other
and their combined efficiency has improved.

A significant role in this regard has of course
been played by factors such as easy and regular
availability of necessary quantity and quality of
intermediate inputs and improved infrastructure,
especially the transport and communication net work
and market expansion. Increasingly larger allocations

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[5]Although relative contribution of labour quality
is found to have declined during seventies as compared
to sixties in our study, this is not to mean that
labour quality is in fact deteriorating. Though the
number of literates in the work force might not have
increased as fast during seventies as during sixties
yet even by experience and effect of education in the
population; the quality of labour is sure to have in-
creased with time.

from plan to plan on the development of basic infra-
structure required for production such as power,
irrigation, transport and communication etc. reveal
that in fact the external economies generated by these
factors have increased the scope of substitution
between the factor inputs by turning them more comple-
mentary to each other, and have increased each other
productivity.

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